ARITHMETICK

MADE ſo EASY,

That it may be

Learned without a MASTER:

After a

New and Conciſe METHOD;

The Like not yet Extant.

Tranſlated from the French, *by*

THOMAS FLETCHER,

Maſter of the BOARDING-SCHOOL at *Ware*,
in *Hertfordſhire*.

The SECOND EDITION.
With ADDITIONS.

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TO

Maſter *William Plumer*,

SON of

William Plumer, Eſq;

Repreſentative in PARLIAMENT
for the County of *Hertford*.

SIR,

AS *Arithmetick*, or an *Enquiry* into the *Properties* and *Uſe* of *Numbers*, has ſo great a Tendency to open and enlarge the Faculties of the Mind, I beg Leave to prefix *your* NAME to this *Treatiſe*; in order to excite your Endeavours to keep up the Luſtre of *your* worthy FAMILY; by being a true Lover of your *Country*, by diſtinguiſhing your Zeal for glorious *Liberty*, and by a hearty Attachment to His preſent *Majeſty*, and His moſt illuſtrious *Progeny*; which is the ardent Wiſh of,

SIR,

Your moſt obedient
humble Servant,

Tho. Fletcher.

Ware,
January 19.
$17\frac{42}{43}$.

THE

Tranſlator's PREFACE.

ARITHMETICK has been ſo much ſtudied of late Years, that we are not to wonder, that ſo many Books have been publiſhed to improve it; and the manifeſt Advantages that accrue to the preſent Age, in being able to ſettle *Accompts* ſo much eaſier and quicker than the former, are a Motive to induce all Perſons to encourage every Attempt to render a *Science*, which is ſo abſolutely neceſſary in every Station of Life, ſtill more clear and familiar.

IT is certain, that many *Eſſays* have been publiſhed in every *Science*, for the Help and Improvement of Learners; but moſt on this Subject have been deficient in proper Inſtructions, ſuited to the Reaſon and Capacities of Children; a Defect, which, I may venture to ſay, is amply ſupply'd in this *Tract*; and therefore do recommend it to Parents and Maſters, as excelling all others in its *Method* and *Deſign*.

THE *Rudiments* of this *Science* are here laid open in ſo plain a Manner, as to give a Child, of a common Capacity, a good Idea of the *four Fundamental Rules* in a few Hours, which is ſeldom attained but with the Expence of ſome Months, at many *Schools.*

THE *Author* proceeds to explain and exemplify the *four firſt Rules* at large, in ſuch a Manner, that any one, who can read, may ſoon attain to a good Notion of the *Principles* of *Arithmetick:* For, if two or more *Children* together, each with one of theſe *Books* in their Hands, will be attentive to the *Examples*, whilſt one reads the *Explanations*, they may receive the ſame Inſtructions, as if a *Maſter* ſtood by, directing them thro' all the *Operations.*

THE *Treatiſe of Fractions* is ſo very plain, the *Expreſſions* ſo familiar, and the *Examples* ſo eaſy, that I am of Opinion, whoever can read a Hiſtory, and take in it's Circumſtances, may, with the ſame Eaſe, comprehend this moſt difficult Part of *Vulgar Arithmetick.*

THE *Rule of Three*, or *Proportion*, and all Parts of *Practical Accompts*, are laid down with ſo much Order and Perſpicuity, ſo purpoſely adapted to the meaneſt Capacities, that we may reaſonably expect to ſee young Perſons ſooner and better acquainted with *Arithmetick*, who have the Advantage of this Book.

Mathematicks, of which *Arithmetick* is the firſt Branch, is allowed to be a very proper *Science*, for enlarging the Underſtanding, and ſtrengthening the Judgment, to diſcern between Truth and Error; for which Reaſon they begin abroad very early with their Children, to initiate them into this uſeful Part of Learning: Wherefore, I conceive, it might not be amiſs for *Miſtreſſes* of Schools, and ſuch *Maſters* as teach to read, to put their Scholars into the *firſt Part* of this Book, as ſoon as they can read the *Bible*; whereby Children would know ſomething of *Numbers*, before they begin to make *Figures*, and become early Proficients therein.

THE *Penny-Intereſt* is mentioned in no *Engliſh Arithmetick* that ever I ſaw; nor indeed is it the Method of ſtating the Rate of *Intereſt* any-where in *England*, that I know of; but, as it is the common Method in *France*, *Holland*, &c. it may be uſeful to *Merchants*, and others trading to thoſe *Parts*.

THOSE Perſons, who, in their *Apprenticeſhips*, or after ſome Abſence from School, have moſtly forgot, what they formerly knew of *Arithmetick*, (which frequently happens for want of a good Foundation therein) will here find the eaſieſt, and perhaps the beſt Guide, that ever was offered them from the *Preſs*; nor need ſuch be diſcouraged at the Difficulty of attaining this, which is made ſo eaſy, as to be learn'd by a Child.

HERE are ſo many excellent Things, intirely new, and ſuch a Variety of *Operations* and *Proofs*, not to be met with elſewhere, that it would be tedious to mention all the Particulars; and therefore I ſhall content myſelf with ſaying, that it contains all that is neceſſary for common Trade or Buſineſs, after the conciſeſt and beſt Methods, conſiſtent with the Deſign of teaching Children, that are utterly unacquainted with Figures; which no Tract in *Engliſh*, that I know of, can ſo juſtly pretend to: And this *Second Edition* is ſo much better ſuited to the preſent Way of teaching *Arithmetick* in *England*, that I doubt not but it will be more acceptable and uſeful to the Publick, than the *former*.

INSTEAD of the *Spaniſh*, I have uſed, throughout this *Edition*, the *Italian* Method of *Diviſion*, which is taught in moſt of our *Schools*; tho' in treating of *Diviſion*, I have retained a *Specimen* of ſeveral *other Sorts*, for the ſake of Curioſity, and to amuſe the Learner at his Leiſure-hours.

I HAVE alſo inſerted *Tables* of *Engliſh Weights* and *Meaſures*, inſtead of the *French*, which were in the *former Edition*; and without altering the *Author's Method*, have changed his *Examples* into *others*, which will better ſuit the *Engliſh* Scholar.

In ſome of the *Rules*, particularly in *Tare* and *Tret*, *Exchange*, the *Fineneſs* of Gold and Silver, and *Alligation Alternate*, I have made ſome *Additions* to render this excellent *Compend* the more complete; and ſuch as I judge the *Author* would have made, was he now to publiſh it in *Engliſh*.

What I ſhall further add, ſhall be by way of Apology for myſelf, and ſubmit the Merit of the Performance to the Judgment of the Publick. Some Perſons, no doubt, will, at firſt View, be ready to blame me, for publiſhing a Book, which, they imagine, ſeems to ſtrike ſo directly at my own Intereſt, and that of other *Maſters*, who teach *Arithmetick*; but ſince my Deſign was to ſerve the *riſing Generation*, that alone may be deem'd a ſufficient Plea; and, as no Perſon in good Circumſtances, who has Opportunity, and judges wiſely, will refuſe his Son the Benefit of a ſkilful, induſtrious *Maſter*, on Account of *this*, or any *other Book*; I hope, the ingenious *Teacher* will receive no Prejudice hereby; but will make ſuch *Amendments*, as he ſhall think fit, for the Improvement of thoſe he has under his Care. The *Language* of ſuch Books as this is not expected to be fine, and when *this* is conſider'd as a *Tranſlation*, which contains Directions to Perſons of the meaneſt Capacity, it is no Matter how low the *Expreſſions* are, provided they be plain and intelligible.

WHAT Miſtakes may have crept into this *Edition*, thro' the *Copying* or *Printing*, I hope the *Reader* will make due Allowance for; when he conſiders the Nature of the *Work*, the Diſtance I live at from the *Preſs*, and my being conſtantly engaged every Day, for 8 or 9 Hours, in my School at *Ware*, near *Hertford*.

Jan. 19. $17\frac{39}{40}$. *Tho. Fletcher.*

ERRATA.

PAge 10, Line 18, for 1 read 4. p. 12, l. 21, for 14 r. 24. p. 71, l. 7, for $\frac{4}{7}$ read $\frac{4}{3}$. p. 196, l. 18, for 1 read a. p. 300, l. 4, for $\frac{1}{2}$ read $\frac{1}{4}$. p. 302, l. 2, read $\frac{1}{12}$ of the *Weight*, &c.

THE

THE AUTHOR TO THE READER.

THE *chief Deſign I had in View, in compoſing this Piece of* Arithmetick, *was to inſtruct young Beginners in ſuch a Manner, as might remove all the Difficulties, which generally lie in the Way to the attaining of this* Science; *and to make the* Principles *thereof more intelligible, than all other Books which have hitherto appear'd on this Subject.*

To anſwer this Purpoſe, I have begun in the eaſieſt Manner imaginable, and have proceeded by little and little, till by degrees I have arriv'd at thoſe Rules, *which ſeem the moſt difficult; ſo that thoſe who can but read, tho' they hardly know ſo much as the* Figures, *may be able to learn* Arithmetick *by the Help of this Book only, provided they read it thro' with Care and Attention.*

In order that the Grounds, Subſtance, and Meaning of this Science, might be eaſily underſtood, I have drawn up ſeven new Tables, *which are every one very eaſy: The firſt is for* Numeration; *the ſecond for* Addition; *the third for* Subtraction; *the fourth for* Multiplication; *the fifth for* Diviſion; *the ſixth to gain ſpeedily the Uſe, and Facility of working readily all Sums of* Addition, *both large and ſmall; and the ſeventh is a* Table *of* Multiplication *and* Diviſion, *in which are the* four Fundamental Rules, *both in* whole Numbers *and* Fractions, *with their* Reductions, *the* Rule of Three Direct, Inverſe, *and the* Rule of Fellowſhip, *&c. This* Table *ought to be well got by Heart by every one that would make a ſpeedy Progreſs in* Arithmetick, *of which theſe* Tables *are an* Abridgment, *eſpecially the laſt.*

But to explain the Whole at large, and in Particulars, I have begun again at Addition *and* Subtraction, *both in* whole Numbers, *and in* Pounds Shillings *and* Pence, *by two new Methods, that are much eaſier than what is uſually practis'd, which give an Inſight into* Diviſion, *and make it eaſy, tho' it is juſtly eſteemed the moſt difficult of the* four Fundamental Rules. *After which I have handled* Multiplication *and* Diviſion, *in* whole Numbers, *ſhewing how to work the* Proofs *as you go along, and at the ſame time, without ſetting down one ſingle* Figure *more, or running the Hazard of being miſtaken in the working, or of beginning any* Sum *again, which no one, as I know of, has yet taught. Next to this, I have ſet the Treatiſe of* Fractions, *explain'd very intelligibly, and in a very good Order, with Terms that every body underſtands, and in little* Examples, *which I choſe on purpoſe to make them eaſily apprehended. After this Treatiſe follow the* Examples *of* Multiplication *and* Diviſion, *of all Sorts of Species and Subſpecies, in all Caſes, and by the beſt, the eaſieſt, and the ſhorteſt Methods, with clear* Explanations, *ſuited to the Capacity of all, even of Children. After which I have explained, by ſufficient Examples, the* ſix Sorts *of the* Rule of Three, *or* Proportion, *which ſerves oftentimes to reſolve the moſt difficult Queſtions. Next follow the Rules of* Fellowſhip, Bankruptcy, Loſs *and* Gain, Tare *and* Tret, Barter, Simple Intereſt, Diſcount, Compound Intereſt, Equation of Payments, Exchange, Of *the* Fineneſs *of* Gold *and* Silver, *after the eaſieſt and ſhorteſt Methods; and the Rules of* Alligation Medial *and* Alternate, *by a Method entirely new. Laſtly, I have inſerted the* Rules *of* Falſe Poſitions, *with ſeveral Queſtions upon different Subjects, and their Anſwers;* Arithmetical *and* Geometrical Progreſſions; *alſo the* Square *and* Cube Roots: *The Whole being laid down in a very perſpicuous* Order.

ARITH-

ARITHMETICK MADE EASY.

INTRODUCTION.

ARITHMETICK is a *Science*, which teaches both to number truly, and to *caſt up* with Expedition and Exactneſs, any Sum whatever.

NUMBER is a *Collection* or *Quantity* of *Units.*

IN *Arithmetick* there are but *nine* different *Figures* and the *Cypher* 0, which ſignifies *nothing* when it ſtands by itſelf, but when it is plac'd on the Right-hand of any *Figure*, it makes the *Figure* become ten times its *common Value.*

The Names *of the* Figures.

Units.

1 One	I.	*j.*
2 Two	II.	*ij.*
3 Three	III.	*iij.*
4 Four	IV.	*iiij.* or *jb.* or *iv.*
5 Five	V.	*v.*
6 Six	VI.	*vj.*
7 Seven	VII.	*vij.*
8 Eight	VIII.	*viij.*
9 Nine	IX.	*jx. viiij.*

Tens of Units.

10 Ten	X.	*x.*
20 Twenty	XX.	*xx.*
30 Thirty	XXX.	*xxx.*
40 Forty	XXXX. or XL.	*xxxx.* or *xl.*
50 Fifty	L.	*l.*
60 Sixty	LX.	*lx.*
70 Seventy	LXX.	*lxx.*
80 Eighty	LXXX.	*lxxx.*
90 Ninety	XC.	*lxxxx.* or *xc.*

Hundreds

Hundreds of Units.

100	One Hundred	C.	C.*c*
200	Two Hundred	CC. or IICC.	*cc.* or ij^{c}
300	Three Hundred	CCC.	iij^{c}
400	Four Hundred	CCCC.	$iiij^{c}$ or *jvc*
500	Five Hundred	D. or VC. or IↃ.	v^{c}
600	Six Hundred	DC. or IↃC.	vj^{c}
700	Seven Hundred	DCC.	vij^{c}
800	Eight Hundred	DCCC.	$viij^{c}$
900	Nine Hundred	DCCCC. or IXC.	ix^{c}

Thouſands.

1000	One Thouſand	M. or I or CIↃ	*m.*
2000	Two Thouſand	XX^{c}. or IIM	ij^{m}.
3000	Three Thouſand	XXX^{c}. or IIIM.	iij^{m}.
4000	Four Thouſand	XXXX^{c}. or XLC.	$iiij^{m}$.
5000	Five Thouſand	LC. or VM.	v^{m}.
6000	Six Thouſand	VIM.	vj^{m}.
7000	Seven Thouſand	VIIM.	vij^{m}.
8000	Eight Thouſand	VIIIM.	$viij^{m}$.
9000	Nine Thouſand	IXM.	ix^{m}.
10000	Ten Thouſand	$\overline{X}$ or XM.	x^{m}.
100000	a Hundred Thouſand	CM.	c^{m}.

11	Eleven	XI.	*xj.*
12	Twelve	XII.	*xij.*
13	Thirteen	XIII.	*xiij.*
14	Fourteen	XIV.	*xiv.* or *xiiij.*
15	Fifteen	XV.	*xv.*
16	Sixteen	XVI.	*xvj.*
17	Seventeen	XVII.	*xvij.*
18	Eighteen	XVIII.	*xviij.*
19	Nineteen	XIX.	*xix.*
20	Twenty	XX.	*xx.*
21	Twenty-one	XXI.	*xxj.*
22	Twenty-two	XXII.	*xxij.*
23	Twenty-three	XXIII.	*xxiij.*
24	Twenty-four	XXIV.	*xxjv.*
25	Twenty-five	XXV.	*xxv.*
26	Twenty-ſix	XXVI.	*xxvj.*
27	Twenty-ſeven	XXVII.	*xxvij.*
28	Twenty-eight	XXVIII.	*xxviij.*
29	Twenty-nine	XXIX.	*xxjx.*
30	Thirty	XXX.	*xxx.*
31	Thirty-one	XXXI.	*xxxj.*
32	Thirty-two	XXXII.	*xxxij.*
33	Thirty-three	XXXIII.	*xxxiij.*
34	Thirty-four	XXXIV.	*xxxjv.*
35	Thirty-five	XXXV.	*xxxv.*
36	Thirty-ſix	XXXVI.	*xxxvj.*
37	Thirty-ſeven	XXXVII.	*xxxvij.*
38	Thirty-eight	XXXVIII.	*xxxviij.*
39	Thirty-nine	XXXIX.	*xxxjx.*

40	Forty	XL.	*xl.*
41	Forty-one	XLI.	*xlj.*
42	Forty-two	XLII.	*xlij.*
43	Forty-three	XLIII.	*xliij.*
44	Forty-four	XLIV.	*xliv.*
45	Forty-five	XLV.	*xlv.*
46	Forty-ſix	XLVI.	*xlvj.*
47	Forty-ſeven	XLVII.	*xlvij.*
48	Forty-eight	XLVIII.	*xlviij.*
49	Forty-nine	XLIX.	*xljx.*
50	Fifty	L.	*l.*

After this manner they may expreſs any *Number*, as for Example, Five hundred and fifty-eight is expreſſed thus, 558, DLVIII, or *v*^{c}*lviij*; and the preſent Year in the three different ways of *Notation* ſtands thus, 1739, or MDCCXXXIX, or *mvij*^{c}*xxxix*.

NUMERATION TABLE.

B					A
Hundreds of thouſands	Tens of thouſands	Number of thouſands	Hund. of units	Tens of units	Number of units.
3	0	5	9	2	0
Three hundred	——	*Five thouſand*	*Nine hund.*	*and twenty*	——
C					D

In order to *number* the ſix *Figures* in this *Table*, you muſt begin to read at the Right-hand under A, going backwards to B on the Left-hand; and to expreſs the *Value* of theſe ſix *Figures* as one *Sun*, begin over C, and read on till you come to the place over D.

You ſee by this *Table*, that the ſame *Name* is placed over the *Cyphers*, as muſt have been, if there had been any other *Figure* in their Place.

Another

Another LARGER TABLE.

Thouſ. of Mill.			Millions			Thouſands			Units		
B Hundreds of	Tens of	Number of	Hundreds of	Tens of	Number of	Hundreds of	Tens of	Number of	Hundreds of	Tens of	Number of . . . . A
3	2	5	6	7	8	9	9	4	1	7	2
C Three hundred	twenty	five thouſand of Millions	Six hundred	ſeventy	eight Millions	Nine hundred	ninety	four thouſand	One hundred	ſeventy	two Units D

AFTER you have read the Word *OF*, which is under *Numbers*, *Tens*, *Hundreds*; you muſt pronounce the Words *Units*, *Thouſands*, *Millions*, or *Thouſands of Millions*, which are under the Line;

and make every *Word* anſwer to the *Figure*, which is over-againſt it.

Seventy, or *Threeſcore and ten*, 70, are the ſame thing.

Eighty, or *Fourſcore*, 80, are alike.

Ninety, or *Fourſcore and ten*, 90, are alſo the ſame, and of the ſame Value.

A TABLE of ADDITION.

Definition.

ADDITION is nothing more, than the *adding up* of ſeveral *Numbers*, or *Sums*, of the ſame *Name*, or *Denomination*, to make one *Total*; which ſhould be equal in *Value*, to all the *Sums* given to be caſt up,

Add - - -	1	1	1	1	1	1	1	1	1	1
with - - -	0	1	2	3	4	5	6	7	8	9
the Total will be -	1	2	3	4	5	6	7	8	9	10
Add two - -	2	2	2	2	2	2	2	2	2	2
with 0, 1, 2, &c. -	0	1	2	3	4	5	6	7	8	9
to make - -	2	3	4	5	6	7	8	9	10	11
Three - - -	3	3	3	3	3	3	3	3	3	3
joined to - -	0	1	2	3	4	5	6	7	8	9
makes - - -	3	4	5	6	7	8	9	10	11	12
Add to - -	4	4	4	4	4	4	4	4	4	4
0, 1, 2, 3, &c. -	0	1	2	3	4	5	6	7	8	9
makes - - -	4	5	6	7	8	9	10	11	12	13
Five - - -	5	5	5	5	5	5	5	5	5	5
with 0, 1, 2, &c. -	0	1	2	3	4	5	6	7	8	9
makes - - -	5	6	7	8	9	10	11	12	13	14
Six and 0, 1, - -	6	6	6	6	6	6	6	6	6	6
2, 3, 4, &c. - -	0	1	2	3	4	5	6	7	8	9
makes - - -	6	7	8	9	10	11	12	13	14	15
Seven - - -	7	7	7	7	7	7	7	7	7	7
join'd to 0, 1, 2, &c.	0	1	2	3	4	5	6	7	8	9
makes - - -	7	8	9	10	1	12	13	14	15	16
Adding - - -	8	8	8	8	8	8	8	8	8	8
with - - -	0	1	2	3	4	5	6	7	8	9
the Total is - -	8	9	10	11	12	13	14	15	16	17
Joining - -	9	9	9	9	9	9	9	9	9	9
with - - -	0	1	2	3	4	5	6	7	8	9
n all makes - -	9	10	11	12	13	14	15	16	17	18

See the Explanation of this Table in Page 13.

A TABLE of SUBTRACTION.

Definition.

By SUBTRACTION, a *leſſer Sum*, or *Quantity*, is *once* taken from a *larger* of the ſame *Name*, or *Denomination*; to ſhew the *Difference*, or *Remainder*, when the *leſs* is taken from the *greater*.

Debt - - - - - -	1	2	3	4	5	6	7	8	9	10
Pays - - - - - -	0	1	2	3	4	5	6	7	8	9
remains - - -	1	1	1	1	1	1	1	1	1	1
One owes - -	2	3	4	5	6	7	8	9	10	11
and pays - -	0	1	2	3	4	5	6	7	8	9
ſtill owes - - - -	2	2	2	2	2	2	2	2	2	2
The Difference of -	3	4	5	6	7	8	9	10	11	12
and - - -	0	1	2	3	4	5	6	7	8	9
is - - - - - -	3	3	3	3	3	3	3	3	3	3
Between - - - -	4	5	6	7	8	9	10	11	12	13
and - - -	0	1	2	3	4	5	6	7	8	9
the Difference is -	4	4	4	1	4	4	4	4	4	4
Whoever receives -	5	6	7	8	9	10	11	12	13	14
and ſpends - -	0	1	2	3	4	5	6	7	8	9
has remaining - -	5	5	5	5	5	5	5	5	5	5
One owes me - -	6	7	8	9	10	11	12	13	14	15
but pays - -	0	1	2	3	4	5	6	7	8	9
owes afterwards	6	6	6	6	6	6	6	6	6	6
From - - -	7	8	9	10	11	12	13	14	15	16
taking - - -	0	1	2	3	4	5	6	7	8	9
remains - - - - -	7	7	7	7	7	7	7	7	7	7
Out of - - -	8	9	10	11	12	13	14	15	16	17
paying - - -	0	1	2	3	4	5	6	7	8	9
leaves - - -	8	8	8	8	8	8	8	8	8	8
Received - -	9	10	11	12	13	14	15	16	17	18
ſpent - - - - -	0	1	2	3	4	5	6	7	8	9
continues - - -	9	9	9	9	9	9	9	9	9	9

See the Explanation of this Table in Page 13.

MULTIPLICATION TABLE.

Definition.

MULTIPLICATION is only the *adding up* of any *Quantity*, or *Number* of Things, as often to itſelf, as there are *Units* in the other *Number*, call'd the *Multiplier*, and ſet undermoſt.

Multiplicands - - -	0	1	2	3	4	5	6	7	8	9
Multiplier - -	1	1	1	1	1	1	1	1	1	1
Products - - - -	0	1	2	3	4	5	6	7	8	9
Multiplicands - -	0	1	2	3	4	5	6	7	8	9
multiplying by - -	2	2	2	2	2	2	2	2	2	2
produce - - -	0	2	4	6	8	10	12	14	16	18
Numbers to be multipl.	0	1	2	3	4	5	6	7	8	9
Multiplier - - - -	3	3	3	3	3	3	3	3	3	3
Products - - - -	0	3	6	9	12	15	18	21	24	27
Sums to be multiplied	0	1	2	3	4	5	6	7	8	9
by the Multiplier -	4	4	4	4	4	4	4	4	4	4
give the Products -	0	4	8	12	16	20	24	28	32	36
Multiplicands - - -	0	1	2	3	4	5	6	7	8	9
Multiplicator - - -	5	5	5	5	5	5	5	5	5	5
Products - - -	0	5	10	15	20	25	30	35	40	45
The Numbers - -	0	1	2	3	4	5	6	7	8	9
counted 6 times - -	6	6	6	6	6	6	6	6	6	6
produce - - - -	0	6	12	18	24	30	36	42	48	54
Sums multiplied - -	0	1	2	3	4	5	6	7	8	9
by the Multiplier - -	7	7	7	7	7	7	7	7	7	7
their Products - -	0	7	14	21	28	35	42	49	56	63
Numbers multiplied -	0	1	2	3	4	5	6	7	8	9
by the Multiplier -	8	8	8	8	8	8	8	8	8	8
will produce - - -	0	8	16	24	32	40	48	56	64	72
Multiplicands - -	0	1	2	3	4	5	6	7	8	9
Multiplicator - - -	9	9	9	9	9	9	9	9	9	9
Products - - - -	0	9	18	27	36	45	54	63	72	81

See the Explanation of this Table in Page 14.

A TABLE of DIVISION.

Definition.

DIVISION is always the *ſeparating a Sum* into as many *equal Parts,* as there are *Units* in the *Number* that divides.

Dividends - - - - -	0	1	2	3	4	5	6	7	8	9
Diviſor - - - - -	1	1	1	1	1	1	1	1	1	1
Quotients - - - - -	0	1	2	3	4	5	6	7	8	9
Of the Dividends -	0	2	4	6	8	10	12	14	16	18
the half - - -	2	2	2	2	2	2	2	2	2	2
is - - - - - - - -	0	1	2	3	4	5	6	7	8	9
Of - - - - - - -	0	3	6	9	12	15	18	21	24	27
the third - - - - -	3	3	3	3	3	3	3	3	3	3
is - - - - - - - -	0	1	2	3	4	5	6	7	8	9
Numbers to divide -	0	4	8	12	16	20	24	28	32	36
Diviſor - - - - -	4	4	4	4	4	4	4	4	4	4
Quotients - - - - -	0	1	2	3	4	5	6	7	8	9
Sums to divide - -	0	5	10	15	20	25	30	35	40	45
of which the 5th -	5	5	5	5	5	5	5	5	5	5
is exactly - - - - -	0	1	2	3	4	5	6	7	8	9
Dividends - - - -	0	6	12	18	24	30	36	42	48	54
divided by 6 - - -	6	6	6	6	6	6	6	6	6	6
produce - - - - -	0	1	2	3	4	5	6	7	8	9
Divide - - - - -	0	7	14	21	28	35	42	49	56	63
by 7 - - - - - -	7	7	7	7	7	7	7	7	7	7
wil give - - - - -	0	1	2	3	4	5	6	7	8	9
Part the Sums - -	0	8	16	24	32	40	48	56	64	72
among 8 Perſons - -	8	8	8	8	8	8	8	8	8	8
each will have - -	0	1	2	3	4	5	6	7	8	0
In - - - - - - -	0	9	18	27	36	45	54	63	72	81
the Diviſor 9 - - -	9	9	9	9	9	9	9	9	9	9
is 0, 1, 2, &c.	0	1	2	3	4	5	6	7	8	9

See the Explanation of this Table in Page 14.

An Explanation of the Table of Addition, *in Page* 9.

OBSERVE that the *Numbers* muſt be of the ſame *Name*, that is to ſay, they muſt denote the ſame ſort of thing. For Inſtance, you can't add 4 *Men*, and 3 *Pounds* together, to make the *Total* 7 ſignify either 7 *Men*, or 7 *Pounds*. Therefore *Pounds* is the *Name*, or *Denomination* of a *Sum*, which ſignifies *Pounds*; *Men* is the *Name* you give a *Sum*, that repreſents *Men*; and *Fathoms* you call that *Sum* by, which denotes *Fathoms*, &c. In each of the *Squares* is a little Addition-Sum, which is wrought as in great Sums, by *adding* the two upper *Numbers* together to make the third.

An Explanation of the Table of Subtraction, *in Page* 10.

IN every *Square* of this *Table* is a little *Subtraction Sum*, wrought after the ſame manner as in larger Sums; wherein the *Second Number* is taken from the *Firſt*, to ſhow the *Difference* or *Remainder* in the laſt Line, which is under the little Stroke in each *Square*.

Addition and *Subtraction* are exactly the contrary of each other; as may be ſeen in theſe two *Tables*, compos'd of the ſame *Numbers*, but differently placed.

THE *Debt*, the *Payment*, and *Remainder*, ought to be the ſame *Sort* of Things.

An Explanation of the Multiplication *Table, in Page* 11.

IN each *Square* is a little *Example* of *Multiplication*, performed as in larger *Numbers*, in counting the firſt *Number* as many times as there are *Units* in the ſecond; which gives the *Product*, as in the third *Number*.

Multiplication is a ſhort way of *Addition*, and all the Difference is, that by *Addition* you join ſeveral Sums, equal or unequal, together; and by *Multiplication* you join none but equal ones.

An Explanation of the Table of Diviſion, *in Page* 12.

IN every one of the *Squares* is a little Specimen of *Diviſion*, in which, as in great Sums, you ſeek *how many times* the *ſecond Number* is contained in the *firſt*; which being found, you ſet it down as a *Quotient* ſomewhere near the *Sum*; afterwards you may multiply that into the *Diviſor*, which is the ſecond *Number*, and that will give you a *Product*, equal to the firſt *Number* at Top.

Diviſion is exactly the Reverſe of *Multiplication*.

A Table for Addition *and* Subtraction.

1 and	2	3	4	5	6	7	8	9	10
make	3	6	10	15	21	28	36	45	55
2 and	2	3	4	5	6	7	8	9	10
make	4	7	11	16	22	29	37	46	56
3 and	2	3	4	5	6	7	8	9	10
make	5	8	12	17	23	30	38	47	57
4 with	2	3	4	5	6	7	8	9	10
makes	6	9	13	18	24	31	39	48	58
5 with	2	3	4	5	6	7	8	9	10
makes	7	10	14	19	25	32	40	49	59
6 with	2	3	4	5	6	7	8	9	10
makes	8	11	15	20	26	33	41	50	60
7 and	2	3	4	5	6	7	8	9	10
make	9	12	16	21	27	34	42	51	61
8 and	2	3	4	5	6	7	8	9	10
make	10	13	17	22	28	35	43	52	62
9 and	2	3	4	5	6	7	8	9	10
make	11	14	18	23	29	36	44	53	63

EXPLANATION.

BEGIN on the *left* hand at *Top*, and ſay, 1 and 2 make 3 under the little *Stroke*, which with the 3 *at Top*, in the next *Square*, makes 6, placed *beneath* it; and this 6 with the 4 in the *upper* Part of the *Square* following, gives 10 *below*, &c. Continue after this manner in all the *Rows* of *Squares*, proceeding from the *left* hand to the *right*, and you'll ſoon find yourſelf Maſter of *Addition*. But for *Subtraction*, you muſt go back again from the *right* hand to the *left*, ſaying, for *Example*; from 55 take the 10 *at Top*, and there remains 45 *on the Side*; from which take the 9 *above* it, and you'll have 36 in the *Square* on the *left* hand; and ſo of the reſt.

A Table

A Table of MULTIPLICATION *and* DIVISION, *&c. which ought to be well got by Heart.*

2 times	1	2	3	4	5	6	7	8	9	10	11	12
makes	2	4	6	8	10	12	14	16	18	20	22	24
3 times	1	2	3	4	5	6	7	8	9	10	11	12
makes	3	6	9	12	15	18	21	24	27	30	33	36
4 times	1	2	3	4	5	6	7	8	9	10	11	12
makes	4	8	12	16	20	24	28	32	36	40	44	48
5 times	1	2	3	4	5	6	7	8	9	10	11	12
gives	5	10	15	20	25	30	35	40	45	50	55	60
6 times	1	2	3	4	5	6	7	8	9	10	11	12
gives -	6	12	18	24	30	36	42	48	54	60	66	72
7 times	1	2	3	4	5	6	7	8	9	10	11	12
is - - -	7	14	21	28	35	42	49	56	63	70	77	84
8 times	1	2	3	4	5	6	7	8	9	10	11	12
is - - - -	8	16	24	32	40	48	56	64	72	80	88	96
9 times	1	2	3	4	5	6	7	8	9	10	11	12
is - - -	9	18	27	36	45	54	63	72	81	90	99	108
10 times	1	2	3	4	5	6	7	8	9	10	11	12
produces	10	20	30	40	50	60	70	80	90	100	110	120
11 times	1	2	3	4	5	6	7	8	9	10	11	12
produces	11	22	33	44	55	66	77	88	99	110	121	132
12 times	1	2	3	4	5	6	7	8	9	10	11	12
produces	12	24	36	48	60	72	84	96	108	120	132	144

EXPLA-

EXPLANATION.

IN this *Table*, you find in ſmall *Sums* the four *Rules* of *Arithmetick*, both in *whole Numbers* and *Fractions*, with their *Reductions*; and a *Proof* to each Rule, by the ſame Rule, and by its contrary; the *Rule of Three direct*, and *inverſe*, both in *whole Numbers* and *Fractions*; and alſo the Rules of *Fellowſhip*, &c.

1. *Addition* begins at the *Top* of each *Column*, and proceeds to the *Bottom*.

2 *Subtraction* goes back again from the *Bottom* to the *Top*.

3. *Multiplication* proceeds from the *left* hand to the *right*.

4. *Diviſion* returns from the *right* hand to the *left*.

6 and 2 make 8, as well as 2 and 6.
Take 6 from 8, and there remains 2, as a *Proof*.
Take 2 from 8, and there remains 6.
4 times 2 is 8, as well as 2 times 4.
How many times 2 *is there in* 8? Anſw. 4.
How many times 4 *is there in* 8? Anſw. 2.

Here you may obſerve, that each *Square* contains a *Fraction*; and that $\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, $\frac{5}{10}$, *&c.* are all *Fractions* of equal Value to one another, tho' their Numbers are different: But this you will better underſtand, when you have read over the *Treatiſe of Fractions* hereafter inſerted.

ADDITION.

The Firſt Fundamental Rule.

ADDITION, as we have already ſaid, is nothing more than the *adding*, or *joining* together ſeveral *Sums*, equal or unequal, of the ſame *Name*; that is to ſay, which denote the ſame *Sort* of thing, to find how much they all make in one *Sum*.

To join or caſt up the four *Sums* in the firſt *Example*.

I BEGIN at Top with the *Numbers* on the *right* Hand, and ſay, going downwards, 6 and 0 is but 6, and 1 is 7, and 3 is 10; I ſet down the 0 at *Bottom* between the two Lines, and carry the *Ten* to be added up with the *next* Line. Then going again to the *Top* of the *next Row*, I ſay; 1 which I carry, and 7 is 8; and 9 is 17, and 2 is 19, and 4 is 23 *Tens*; I ſet down the 3 *below*, between the two Lines, and carry the two *Tens* (which are two *Tens* of *Tens*, or two *Hundreds*). Afterwards, beginning at Top with the *Hundreds*, I caſt them up, ſaying; 2 that I carry, and 8, is 10, and 9 is 19, and 9 is 28, and 3 is 31; I ſet down 1 between the two Lines, and carry the 3 *Tens* (which are three *Tens* of *Hundreds*, or 3 times 10 *Hundred*, or 30 *Hundred*, which are 3 *Thouſand*). Laſtly, aſcending to the *Thouſands*, I ſay in like manner; three *Tens* that I carry and 9 is 12, and 8 is 20, and 5 is 25 *Thouſand*; I ſet down the 5 underneath, and more to the left (hand). I ſet down the two *Tens* of *Thouſands*, the Sum being now finiſh'd.

ALL *Sums* in *Addition* of whole *Numbers*, being caſt up after this Method, we ſhall omit explaining the ſecond and third *Examples*; only take good notice of the *Explanation* above, and alſo of the *Proof*, which is under the *Sum*; and compare thoſe two *Explanations* with the *Sum*.

HERE you may obſerve, that you muſt always place the *Overplus* of the *Tens*, directly under that *Row* of Figures, which you then caſt up; and carry all the *Tens* to be added up with the next *Row*.

The firſt Example of Addition.

	Tens of Thouſands.	*Thouſands.*	*Hundreds.*	*Tens.*	*Numbers.*	
Add : : : . ; .		9	8	7	6	*Ells.*
with . . . . . ; :		.	9	9	0	*Ells.*
and with ;		8	9	2	1	*Ells.*
and with . . : .		5	3	4	3	*Ells.*
The *Total* will be	2	5	1	3	0	*Ells.*
Proof ; : . ; .		~~3~~	~~2~~	~~1~~	~~0~~	

UNDER the Row of *Numbers* between the two Lines, I ſet down a *Cypher*, becauſe I found it came up to juſt 10.

THE 3 under the *Tens* between the two Lines, is the Overplus of 20, which is two *Tens* of *Tens*, or two *Hundreds*.

THE 1 under the *Hundreds* between theſe two Lines, is the Overplus of 30, which is 3 *Tens* of *Hundreds*, or three *Thouſand*.

THE 5 under the *Thouſands* between theſe two Lines, is the Overplus of 20, which is two *Tens* of *Thouſands*, or 20 *Thouſands*, and are advanc'd to the Place under the *Tens* of *Thouſands*.

An Explanation of the Proof. I begin at the *Thouſands*, ſaying; 9 and 8 is 17, and 5 is 22 *Thouſand*; which taken from the 25 *Thouſand* below, between the two Lines, there *remains* 3, below theſe two Lines: Afterwards going to the *Hundreds*, I ſay; 8 and 9 is 17, and 9 is 26, and 3 is 29 *Hundred*; which taken from the 3 *Thouſand* and 1 *Hundred* at Bottom, which make 31 *Hundred*, there *remains* 2 *Hundred* on the ſide of the 3, which 3 I cancel: Afterwards I proceed to the *Tens*, ſaying; 7 and 9 is 16, and 2 is 18, and 4 is 22 *Tens*; which being taken from the 2 *Hundred* and 3 *Tens* between the two Lines, which make 23 *Tens*, *leaves* 1 *Ten* on the ſide of the 2 *Hundred*, which 2 I ſtrike thro' with my Pen, becauſe I have already join'd it to the 3 *Tens*, to make 23 *Tens*, in order to diſcharge or pay the 22, which are found at Top: Laſtly, going to the *Numbers*, I ſay; 6 and 1 is 7, and 3 is 10; which taken from the *Ten* below the two Lines join'd to the 0 which is between the ſaid two Lines, there *remains* nothing; I ſet down a 0 below, and cancel the *Ten*, that is on the Side: And as there is nothing remains, 'tis a *Proof* that the *Sum* is right. For if you take from the *Sum Total*, all the particular *Sums* which compoſe it, there muſt remain nothing at laſt.

The *Figures* in the Proof Line, being nothing elſe but the *Tens*, which are carried to each Row, they are better ſet down in adding up the *Sum*; whereby you cannot miſtake what Number of *Tens* there is in *each Row* to be carried to the *next*; even ſuppoſe you are call'd off in the middle of a Sum; and the *Proof* is performed much eaſier, as above, without ſetting down another Figure.

Second Example.

Add, or join theſe five *Sums* together, to ſee how much they make in one *Sum*; which is call'd the *Total.*

.	.	2	5	7	8	9	6	*l.*
.	.	.	.	3	7	2	9	*l.*
.	.	.	5	4	3	8	7	*l.*
.	.	.	.	.	8	3	2	*l.*
1	2	4	6	8	7	5	0	*l.*
1	2	7	8	5	5	9	4	*l.*
Proof		1	2	3	2	2	0	

Third Example.

	.	1	2	3	4	5	6	7	8 *s.*
	.	9	1	2	3	4	5	7	3 *s.*
	.	.	2	5	0	0	0	0	0 *s.*
	.	.	.	4	8	0	2	4	9 *s.*
	.	1	3	4	3	9	5	0	0 *s.*
Total.	1	2	0	0	0	0	0	0	0 *s.*
	Pr. 1	2	2	2	2	2	2	0	*s.*

THERE are ſeveral other ways of proving *Addition*. As,

1. AFTER you have added up the *Total* as above, for *Proof*, add up all the Rows together with the *Total*; and if that *ſecond Total* be double the *former*, you may conclude the *Addition* is right.

2. WHEN you have added up the *Total* as before, ſeparate the *top Line*, and add up all the *reſt* of the *Sum* in *another Line*; then add this ſecond *Total* to the top Line, that was ſeparated; and if they make the ſame as the *Total* of the Sum, it is ſuppoſed to be right. Or,

3. SEPARATE the *Sum* into two Parts, and if their *Totals* added together, amount to the ſame as the whole Sum, it paſſes for a *Proof*. See an Example of each.

456	425	424	
258	384	542	
322	256	246	1212
452	423	324	
635	326	456 ———	780
2123 *Tot.*	1814 *Tot.*	1992 *Tot.*	1992
4246 *doub. the Tot.*	1389		
	1814		

Addition of Pounds, *Shillings, and* Pence.

FIRST of all, begin at the *Pence*, and caſt them all up, making a Dot when the Sum comes up to *Twelve*, or more than *Twelve*, carrying what it is more than *Twelve* to the next Figure, and ſet down the Overplus of the laſt *Twelve* at the Bottom; then carry the ***Dots*** or ***Twelves***, which are ſo many ***Shillings***, to add to the other ***Shillings***; which you muſt caſt up in like manner by *Twenties*, and ſet down the Overplus of the laſt *Twenty* at the Bottom under the ***Shillings***; then carry away the *Twenties*, which are ſo many ***Pounds***, and add them to the other ***Pounds***, which muſt be caſt up as is before taught.

Example.

	l.	*s.*	*d.*
	246	12	11
	. 10	15	10 .
	. 45	10	9 .
	302	19	6
P.	$\cancel{1}\cancel{1}\cancel{1}$	0$\cancel{2}$	0

Example.

	246 ***Pounds***	12 ***Shill.***	11 ***Pen.***
	. 10 ***Pounds***	15 ***Shill.***	10 . ***Pen.***
	. 45 ***Pounds***	10 ***Shill.***	9 . ***Pen.***
	302 ***Pounds***	19 ***Shill.***	6 ***Pence***
Pr.	$\cancel{1}\cancel{1}\cancel{1}$	0$\cancel{2}$	0

Explanation. I begin at the ***Pence***, ſaying; 11 and 10 is 21, which is 1 ***Shilling*** and 9 ***Pence***; I make a ***Dot*** by the Side of the Ten, to ſignify 1 ***Shilling***; and I carry the 9 ***Pence*** over, to join to the 9 ***Pence*** below the 10, ſaying; 9 and 9 is 18, which is 1 ***Shilling*** and 6 ***Pence***; wherefore I make another ***Dot*** by the Side of the 9, to ſignify another ***Shilling***, and the 6 ***Pence*** which is over, I ſet down at Bottom, between the two Lines.

THAT being done, I caſt up all the ***Dots*** I have made, becauſe they ſtand for ſo many ***Shillings***; and I ***add*** them to the other ***Shillings***, ſaying; 2 ***Shillings*** that I carry from the ***Pence*** and 2 is 4, and 5 is 9 ***Shillings***; which I ſet down between the two Lines.

AFTERWARDS I caſt up the *Tens* of *Shillings*, which I find to be 3, of which I take the half, ſaying; the half of 3 *Tens* for 30 *Shillings* is 1 *Pound*, and 1 *Ten Shillings* over, which I ſet down by the Side of the 9 to make 19 *Shillings*, and the 1 *Pound* I carry to the other *Pounds*; which I caſt up as before, ſaying; 1 *Pound* coming from the *Shillings* and 6 is 7, and 5 is 12; I ſet down the 2, and carry the 1 to the 4, which makes 5, and 1 is 6, and 4 is 10; I ſet down 0, and 1 which I carry to the 2, makes 3, which I place between the two Lines; and I find the 3 *Sums* added together, amount to 302 *Pounds*, 19 *Shillings*, and 6 *Pence*.

To prove Addition of Pounds, Shillings, and Pence, as in the *Example* above, I take the 2 *hundred Pounds* at Top from the 3 *hundred Pounds* below, and there *remains* 1 at the Bottom, which with the 0 between the two Lines, makes 10 *Tens*, from which I take the 9 at Top, and there *remains* 1 under the 0, which with the 2 following makes 12; from which I take the 11 above, and there *remains* 1 *Twenty Shillings*, or 2 *Ten Shillings*, which with the *Ten Shillings* in the 19 *Shillings*, makes 3 *Ten Shillings*; from which I take the 3 *Ten Shillings* above, and there *remains* a 0, that is to ſay, *nothing*.

AFTERWARDS I take the 7 *Shillings* at Top, from the 9 *Shillings* below, and there *remain* 2 underneath the two Lines; which with the 6 *Pence* between the two Lines, makes 30 *Pence*, from which I take the 30 *Pence* I find at Top, and there remains *nothing*; which is the *Proof*.

THIS Method of adding up the *Pence*, by dotting at every 12, is very ſeldom practiſed; but in long Rows, that amount to 2 or 300 *Pence*, it is very common in Buſineſs, to make a *Dot* at every 60 *Pence*, for 5 *Shillings*; and in common Sums they add up all the *Row* of *Pence* without any ſtopping, and are ready enough, after a little Practice, to tell how many *Shillings* there are in any Number of *Pence* under 120, by having learn'd the following *Pence Table.*

	Pence.		*Sh.*		*Pence.*
Take the 12*th* Part of the *Pence*, gives *Shillings.*	20	is	1	:	8
	30	——	2	:	6
	40	——	3	:	4
	50	——	4	:	2
	60	——	5	:	—
	70	——	5	:	10
	80	——	6	:	8
	90	——	7	:	6
	100	——	8	:	4
	110	——	9	:	2
	120	——	10	:	—

SUBTRACTION.

The Second Fundamental Rule.

SINCE *Subtraction* is only *once* taking away a *leſſer Sum* from a *larger*, being both of the ſame kind; to know the *Difference* between the greater and leſſer, you muſt begin with the *leſſer Sum*, at the firſt *Figure* on the *right* Hand, as in the Example following, ſaying;

Once 7 from 2 at Top, I cannot; therefore I borrow 1 *Ten* of the 8 on the Side, to make it 12; and then there *remain* 5, which I place underneath between the two Lines, not forgetting the *Ten* which I borrow'd.

AFTER that, carrying the one I borrow'd to 9 makes 10, which from 8 at Top, I cannot, without borrowing 1 *Ten*, which makes it 18, and then there *remain* 8, to be ſet down between the two Lines: Afterwards carrying the 10 which I borrowed to the *Hundreds*, I ſay; 1 that I borrowed and 8 is 9; taken from the 6 at Top, made 16 by borrowing, and there *remain* 7, which I ſet down between the two Lines, remembring the 1 which I borrow'd from the 7 at Top. Laſtly, going to the *Thouſands*, I ſay; 1 that I borrow'd and 3 make 4, taken from 7 at Top, and there *remain* 3, which I place between the two Lines, without carrying any one, having no occaſion to borrow with 7 to pay 4.

Firſt Example.

Debt	7	6	8	2	*l.*
Payment	3	8	9	7	*l.*
Rem. due	3	7	8	5	*l.*

For a *Proof* of which, I look if the *Remainder* join'd to the *Sum paid*, be equal to the *Debt*; ſaying by *Addition*; 5 and 7 is 12, the 2 is at Top; the 1 *Ten* I carry, and ſay; 1 that I carry and 8 is 9, and 9 is 18; the 8 I find at Top: then I carry 1, and 7 make 8, and 8 is 16; the 6 being at Top: Laſtly I carry 1, and 3 makes 4, and 3 is 7, as I find it is in the *Thouſands* Place; which is a certain *Proof* of the *Sum*'s being right. There is alſo another way of proving *Subtraction* by *Subtraction*; in putting the *Remainder* under the *Debt*, which when *ſubtracted*, ſhews the *Payment* exactly.

In the ſecond *Example*, I take 6 from 10, and there *remain* 4; I carry the 10, which the firſt 0 borrow'd of the ſecond, and then I ſay; 1 that I carry and 9 makes 10, from 10, and there *remains* 0.

Lastly, I carry the 1 I borrowed to 8, which makes 9; and this being taken from 10, there *remains* 1; and 1 I carry, taken from 2, *leaves* 1.

Second Example.

Due	2000	*Ells.*
paid	.896	*Ells.*
Remain	1104	*Ells.*

Third Example.

From	1020405	*l.*
taking	.997869	*l.*
will leave	..22536	*l.*

You may, if you will, put the *Remainder* at Top, inſtead of at Bottom; and then it will be like one ſingle *Diviſion*: To inſtance the two laſt *Examples.*

Remainder	1104	*Ells.*
Debt	2000	*Ells.*
Payment	896	*Ells.*

Remains	22536	*l.*
Due	1020405	*l.*
Paid	997869	*l.*

Subtraction of Pounds, Shillings, and Pence.

THE *Pence* in the *Payment*, are firſt to be taken from the *Pence* in the *Debt*, which muſt borrow 1 *Shilling*, or 12 *Pence*, when they are not enow: Afterwards the *Shillings* in the *Payment*, are to be taken from thoſe in the *Debt*, which when their *Number* is too ſmall, are oblig'd to borrow 1 *Pound*, or 20 *Shillings*.

Example.

	l.	*s.*	*d.*
Debt	254	.2	.6
Payment	150	19	11
Remainder	103	.2	.7

Debt	254 *Pounds*	.2 *Shillings*	.6 *Pence.*
Payment	150 *Pounds*	19 *Shillings*	11 *Pence.*
Remainder	103 *Pounds*	.2 *Shillings*	.7 *Pence.*

TO do this *Subtraction-Sum*, you muſt ſay; 11 *Pence* taken from 6 at Top, (which is worth 18 *Pence* by means of the *Shilling* it borrows) and there *remain* 7 Pence; which I ſet down, and carry the *Shilling* I borrow'd; which with the 19 *Shillings* makes 20 *Shillings*, taken from the 2, (which is become 22 *Shillings*, by borrowing a *Pound*, or 20 *Shillings*) and there *remain* 2; and I carry the *Pound* I borrow'd, which with the 0 makes but 1 *Pound*, taken from 4 *leaves* 3; then take 5 from 5, and there *remains* 0; and the 1 taken from 2, *leaves* 1.

To prove it, I add the *Remainder* to the *Payment*, which ſhews the *Debt*, ſaying; 7 and 11 is 18 *Pence*, or 1 *Shilling* and 6 *Pence*; the 6 *Pence* is at Top; and I carry the 1 *Shilling* to the 2, which makes 3, and 19 is 22 *Shillings*; the 2 *Shillings* I find at Top, and the 2 *Ten Shillings*, which make 1 *Pound*, I add to the 3 which gives 4 as above; then 0 and 5 is but 5 plac'd at Top, and 1 and 1 are 2, juſt as above.

Another Example of Pounds, Shillings, and Pence.

	l.	*s.*	*d.*
From	45	00	00
Take	43	15	.6
Remain	.1	.4	.6

From	45 *Pounds*	
Take	43 *Pounds* 15 *Shillings* 6 *Pence.*	
Remain	1 *Pound* 4 *Shillings* 6 *Pence.*	

IN this laſt *Example* ſay; 6 *Pence* taken from 12 *Pence*, *leaves* 6 *Pence*; I carry the *Shilling* I borrow'd to the 15 *Shillings*, which makes 16 *Shillings* taken from 20 *Shillings*, and there *remain* 4 *Shillings*; then I carry the *Pound* I borrow'd to the 3 makes 4, which taken from 5 *leaves* 1, and 4 taken from 4 *leave* nothing.

For Proof, 6 *Pence* and 6 *Pence* is juſt 1 Shilling, which I carry to the 15 makes 16 *Shillings*, and 4 is 20 *Shillings*, juſt 1 *Pound*, which I carry to the 1 and 3, and they make 5, as above, and 4 is equal to the 4 at Top.

IN *Subtraction* of *Time* you muſt take care how you ſet down the two *Sums*.

FOR *Example*; I would know how long it is ſince the 25th of *March* 1715, to *June* 16th 1724; which muſt be done as follows.

	Years	*Months*	*Days*
From	1724	5	16
Take	1715	2	25
Leaves	9	2	21

THE *Year* 1724 is not finiſhed on the 16th of *June*; which is but 5 Months 16 Days, from the firſt of *January*; and the Year 1715 alſo is not completed by the 25th of *March*, which is but 2 Months, and 25 Days, from the firſt of *January* 1715. To ſet down this *Example* in the proper *Terms*, it ought to ſtand thus;

	Years	*Months*	*Days*
From	1723	5	16
Take	1714	2	25
Remain	9	2	21

which gives the ſame *Anſwer* as before.

NOW this Example we think is ſufficient to remove all the Difficulties to be met with in *Subtraction of Time*.

MULTI-

MULTIPLICATION.

The Third Fundamental Rule.

MULTIPLICATION is nothing more than *adding up* the ſame *Sum a certain Number of Times*, fixt by another *Sum* uſually ſet underneath it; to find how much it amounts to after being added to itſelf *as many times*, as the lower *Sum* has *Units*.

THE firſt *Sum* is call'd the *Sum*, or *Number* to be *multiplied*, or elſe the *Multiplicand*.

THE ſecond *Sum*, which is commonly plac'd underneath the former, is call'd the *Multiplier*, or *Multiplicator*.

AND the third, which is ſet alone between two Lines, is call'd the *Product*.

MULTIPLICATION is a *ſhort Way* of performing *Addition*, and all the Difference is, that by *Addition* you add both *equal* and *unequal Sums* together, but by *Multiplication* you add up ſeveral *Sums* that are all *alike*; or, which is the ſame thing, you add up the ſame *Sum* as many times as is fixt by the *Multiplier*, which gives in the *Total* or *Product*, a *Sum* equal to the *Multiplicand* added up as often to itſelf, as there are *Units* in the *Multiplier*.

WHEN two *Sums* are to be *multiplied* by each other, you may ſet which you pleaſe uppermoſt, and the other underneath, as may be moſt commodious; for the *Product* is the ſame both *ways*.

IN the *firſt Example* below, I make 6 the *Multiplier*, to proceed in Order to all the Figures in the *Multiplicand*; beginning with the 4 on the right Hand, I ſay; 6 times 4 is 24; I ſet down the 4 between the two Lines, but always exactly under the *Figure* which *then* multiplies, and I bear the two *Tens* in my Mind; afterwards proceeding to the 3 *Tens* of the *Multiplicand*, I ſay; 6 times 3 is 18, and 2 *Tens* that I carry, makes 20; I ſet down a 0, and keep the 2 *Tens* in Memory; then I go to the 2 *Hundreds*, and ſay; 6 times 2 is 12, and 2 *Tens* that I carry, makes 14 *Tens* (of *Tens*); I ſet down 4, and advance the 1 to the Place of *Thouſands*; ſo I find that 6 times 234, amounts to 1404.

Firſt Example.

Multiplicand	. 2 3 4
Multiplier	. . . 6
Product	1 4 0 4

For Proof; I *part*, or *divide* the 1404 into 6 equal Portions; which I do by ſaying; the *ſixth* Part of 14 *hundred*, is 2 *hundred* in the *Multiplicand*, and there remain 2 of the 14 *hundred*, which are 2 more than the 2 times 6, which is but 12; I join the 2 that remain'd to the 0, to make it 20; the *ſixth* Part of which is 3 *Tens*, and 2 over, which I join to the 4, to make it 24; the *ſixth* Part of which is juſt 4, as in the *Multiplicand*.

IN this *ſecond Example* here, I ſay; 6 times 5 is 30; I ſet down a 0 under the 6 that *multiplies*, and the 3 *Tens* I keep in mind; then proceeding to the 4 *Tens*,

Tens, I ſay; 6 times 4 is 24, and the 3 *Tens* that I carry make 27; I ſet down the 7, and carry the 2 *Tens* to be join'd to the 6 times 2, which is 12; which making it 14, I ſet down the 4, and place the 1 a Figure forwarder in the *Thouſands* Place; whereby I find that 6 times 245 amounts to 1470; but to make myſelf ſure as I go along, by proving what I do, I examine if 245 is, as it ought to be, the *ſixth* Part of 1470, which I find after this Manner.

Second Example.

. 2 4 5	*Multiplicand.*
. . 3 6	*Multiplier.*
1 4 7 0	*Particular Product.*
7 3 5 .	*Another particular Product.*
8 8 2 0	*The Total Product.*

I BEGIN on the left Hand under *Thouſands*, and ſay; the *ſixth* Part of 14 is 2 *hundred*, plac'd at Top, and 2 over, which with the 7 makes 27 *Tens*, the *ſixth* Part of which is 4 *Tens* as at Top, and 3 over, which with the 0 makes 30, whoſe *ſixth* Part is juſt 5, the ſame as in the *Multiplicand*; which proves that I have made no Miſtake, but am right ſo far: Wherefore I go on to the 3 in the *Multiplier*, and ſay; 3 times 5 is 15, I ſet down the 5 under the 3, which now *multiplies*, (which muſt be conſtantly obſerved) and I keep the *Ten* in Memory; afterwards 3 times 4 is 12, and 1 that I carry makes 13; I ſet down the 3, and carry the 1 to 3 times 2, 6, which makes 7, to be ſet down in the Rank of *Thouſands*; ſo I find that 30 times 245 amounts to 7350.

For Proof; I take the *third* Part of 735, which is 245 the *Multiplicand*. This I find, by ſaying, the *third* Part of 7 is 2, and 1 over, which with the 3 following makes 13; the *third* Part of which is 4, and 1 over, which makes the 5 following to be called 15; the *third* Part of which is 5, the ſame exactly as the *Multiplicand*; which proves that I am right, as well as if I had taken the thirtieth Part of 7350; becauſe as I left out the 0 in 30, ſo I did alſo in 7350, which is to be underſtood inſtead of the *Dot* below the firſt *Nothing*. This kind of *Proof* is indeed *Diviſion* by one Figure; which is here taught before the *Rule of Diviſion*, becauſe we ſuppoſe, that by this time every one knows the Principles of the *four Fundamental Rules*, as they are laid down in the *four Tables* at the Beginning of this Book; and that they are ſufficiently taught by the *Table of Diviſion*, to *divide* by any ſingle Figure whatever. To complete the *Sum*, I add 1470 to 7350, which gives the *Product* 8820, equal to 36 times 245.

Now tho' we may be ſure that we are not miſtaken in the *Multiplication*, having prov'd it as we went along; yet poſſibly there may have happen'd ſome Error in caſting up the particular *Products*; wherefore it is proper to prove that Part alſo as in Sums of *Addition*.

Multiplication is proved ſeveral ways: 1ſt, By *multiplying* a *Sum*, that is *twice*, *three times*, or *four times* the *Multiplicand*, into a *half*, a *third*, or a *fourth Part* of the *Multiplier*, or contrarywiſe. 2dly, *Dividing* the *Product* by the *Multiplicand*, in order to find the *Quotient*, or by the Reverſe: But we ſhall add no more of theſe ſort of Proofs, they being too long, and liable to many Inconveniencies.

The prettieſt, ſhorteſt, and readieſt *Proof*, is that, which we juſt now taught in the *foregoing Examples*; for if one ſhould chance to make a Miſtake, one may immediately perceive it by proving the Parts as one goes along; and correct the Error without any great Loſs of Time, or puzzling one's Brains by working the whole *Sum* again, together with the *Proof*, to find out the Blunder at laſt, which is the common Method.

WHEN the *Multiplier* of any *Sum* is a *Number*, which can be meaſured by two ſingle *Numbers*, as in the laſt *Example*, where 6 by 6 makes 36, or 4 times 9 is 36, you may multiply the *Multiplicand* by 6, and then that *Product* by 6, which will give the *Total Product* of 36, without any Addition; or by 4 firſt, and that *Product* by 9; as is plain in the *Examples* following.

245	*Multiplicand.*	245	*Multiplicand.*
6		4	
1470	*Product of the* 6	980	*Product of the* 4
6		9	
8820	*Product of the* 36	8820	*Prod. of the* 36

SOMETIMES you will find it eaſier, and ſhorter, to multiply particular *Products* by ſome ſingle *Number*, that may produce in one Line, the ſame, as the two or three next *Figures* of the *Multiplier*; as in this *Example.*

4268	
246	
25608	*Product of the* 6.
102432	*Product of the* 24 *by* 4 *times the Product of* 6.
1049928	*Total Product.*

24 being 4 times as much as 6, we have here multiplied the *Product* of 6 by 4, which gives a *Product* for the 24 in one Line.

SOMETIMES alſo, it is eaſier to take a *part* of a foregoing *Product*, to give a *Product* for another *Figure* of the *Multiplier*; or to multiply ſome foregoing *Product* by 2, 3, 4, *&c.* as the *Figures* in the *Multiplier* are in proportion to one another; as you may obſerve in the following *Examples*.

Other Examples.

6484	
936	
38904	*Prod. of the* 6.
19452	*half the Prod. of the* 6 *for the* 3.
58356	3 *times the Prod. of the* 3, *for the* 9. *or add the Products of the* 6 *and* 3, *gives the Prod. for the* 9.
6069024	

. . 1080578	*Multiplicand.*
. 216	*Multiplier.*
. . 6483468	*particular Products.*
. 1080578 .	
2161156 . .	
233404848	*Total of the* 3 *Products.*

Sum to be multiplied	. . . 5 4 0 2 8 9	
Multiplicator	. . . . . . 4 3 2	
	. . 1 0 8 0 5 7 8	*particular Products.*
	. 1 6 2 0 8 6 7 .	
	2 1 6 1 1 5 6 . .	
	2 3 3 4 0 4 8 4 8	*Tot. Pro.*

THESE two Sums are a *Proof* of each other, the *Multiplicand* of the firſt being double the *Multiplicand* of the ſecond; and the *Multiplier* of the firſt, being the Half of the *Multiplier* of the ſecond.

A Compendious Way of Multiplication.

TO *multiply* any Sum in whole Numbers by 10, place a 0, on the right hand of the *Sum to be multiplied*, and your Work is done.

IF you are to *multiply* by 100, you muſt add two *Cyphers*; if by 1000, you muſt put three; if by 10000, you muſt join four, *&c.* becauſe a *Unit* with nothing *but Cyphers*, does not change the *Multiplicand*; only you muſt add to it all the *Cyphers*, that are with the *Unit*; which neither *multiplies*, nor *divides*, when it is alone: So theſe *Cyphers*, when they are ſet to the *Multiplicand*, ſerve to increaſe its Value to 10 times, 100 times, 1000 times, *&c.* as much as it was before.

FROM whence we conclude, that to *multiply* a *Sum* by 5, which is the *half* of 10, you may add a *Cypher* to the Right-hand of the Sum, and then take the half of it, and this *half* is the *Product* of the *Multiplication*. For Example, to *multiply* 24 by 5; only *add*, or ſuppoſe a *Cypher* to be added to the 24, which makes it 240; then take the *half* of it, which is 120, the true *Product* of the *Multiplication.*

THE like may be done for other Numbers; ſo that this *Example* is ſufficient to put you upon thinking, and reaſoning after the ſame manner on all Occaſions.

To multiply 200
by 20
produces 4000

You need only place one 2 under the other, and *multiply* them together makes 4, to which *add* the three o's; and ſo in other *Multiplications* of this ſort.

WHOEVER applies himſelf to theſe *Examples*, and the *Explanation* of them, with any tolerable Attention, need not fear being able, in a little time, to do any *Sums* of this kind.

THIS *Example* following is a perfect Summary of all *Multiplication*; which it will be very proper to be well vers'd in, in order to learn perfectly to *multiply*, and *divide* by a ſingle Figure; here being all the Difficulties that can any ways happen therein: But this you may paſs by till you have gone thro' *Diviſion*, and the Treatiſe of *Fractions* following, if you chuſe rather ſo to do.

Sum to be multiplied	1 2 3 4 5 6 7 8 9
Multiplicator	9 8 7 6 5 4 3 2 1
The Sum to be multiplied is equal to	1 2 3 4 5 6 7 8 9
the half of	2 4 6 9 1 3 5 7 8 .
the third part of	3 7 0 3 7 0 3 6 7 . .
the fourth part of	4 9 3 8 2 7 1 5 6 . . .
the fifth part of	6 1 7 2 8 3 9 4 5 . . . .
the ſixth part of	7 4 0 7 4 0 7 3 4 . . . . .
the ſeventh part of	8 6 4 1 9 7 5 2 3 . . . . . .
the eighth part of	9 8 7 6 5 4 3 1 2 . . . .
the ninth part of	1 1 1 1 1 1 1 1 0 1 . . . .
The Total of the 9 *Products*	1 2 1 9 3 2 6 3 1 1 1 2 6 3 5 2 6 9
The Proof of the Addition . .	1 1 2 2 1 4 3 3 3 4 1 2 2 2 1 0 0

You may eaſily ſee if every particular *Product* in this *Sum* be right, by adding ſuch Lines together, whoſe *Multipliers* amount to the ſame as the *Multiplier* whoſe *Product* you are examining; as for Inſtance, the *Product* of the 3 ought to be equal to the *Products* of the 1, and 2, *&c.*

DIVISION.

DIVISION.

The Fourth Fundamental Rule, and its Definition.

DIVISION, which ſignifies to make even *Parts* or *Portions* of any *Sum*, is only the ſeeking out, and finding *how many Times*, or *Parts*, one *Sum* is contain'd in another, that is larger or ſmaller than itſelf; or, which is the ſame thing, to part out a *Sum* into as many equal *Lots*, or *Portions*, as there are *Units* in the *Sum*, call'd the *Diviſor*, which is plac'd underneath the *Dividend*, with a Line between them, or on the Side with a Mark of Separation.

THE Part which belongs to every *Unit*, or every *One* in the *Diviſor*, is placed at the end of theſe two *Sums* after a Line of Separation, and is call'd the *Quotient*; that is to ſay, *how many times*; becauſe it actually denotes *how many times* the *Dividend*, or *Sum* to be *divided*, does contain the *Diviſor*; or, which amounts to the ſame thing, *how many times* the *Diviſor* has been taken out of the *Dividend*, or *Number* to be divided.

Diviſion is exactly the Reverſe of *Multiplication*.

BY *Multiplication* we count up the *Sum* to be *multiplied*, as often as there are *Units* in the *Multiplier*; and on the contrary, by ***Diviſion*** we take away as many equal ***Portions***, or ***Parts*** from the ***Sum*** to be ***divided***, as there are ***Units*** in what we call the ***Diviſor***.

Diviſion is alſo an Abridgment of ***Subtraction***, and the Difference between them is this; that by ***Subtraction*** we take away ***once***, a leſſer ***Sum*** from one, that muſt be as large or larger; and by ***Diviſion*** we take away one ***Sum*** from another; either bigger or leſs, as many times or parts as it is poſſible to do.

IN order to be ready and expeditious in working all manner of ***Diviſions***, you muſt be well vers'd in, and acquainted with, the three foregoing Rules; becauſe ***Diviſion*** is compos'd of ***Multiplication*** and ***Subtraction***; and the Proof of ***Diviſion***, which we ſhall join to the Sum, does conſiſt of ***Multiplication*** and ***Addition***.

WE ſhall ſhew you ſeveral Ways of performing ***Diviſion***, but ſhall begin with the ***Italian***, which we ſhall chuſe to make uſe of, becauſe it ſeems the plaineſt, and eaſieſt for Learners, and is moſt practis'd in ***England***.

An Example of Diviſion after the Italian *Method, by a ſingle Figure.*

To divide 758 Pounds ***equally among*** 6 Perſons.

The Firſt Operation.

Dividend
Diviſor 6) 7 5 8 (1 *Quotient*
6
—
1

I SET down 6 the *Diviſor* on the left hand, and after a Stroke of Separation, I place the *Dividend*, and then inquire, whether 6 the *Diviſor*, be contained in the firſt *Figure* of the *Dividend*; and finding it is *once*, I ſet 1 in the *Quotient*, and I make a *Dot* under the 7, the firſt *Figure* of the *Dividend*, and *multiply* the *Diviſor* 6 by 1, found in the *Quotient*, ſaying; once 6 is 6, which being ſet under the 7, I draw a Line below, and *ſubtract*; ſaying; 6 from 7, and there remains 1; which finiſhes the firſt *Operation*; and this may be proved after the ſame manner as follows, in the *Spaniſh Method.*

The Second Operation.

Dividend

Diviſor 6) $\underset{\cdot}{7}\;\underset{\cdot}{5}\;8$ (1 2 *Quotient*

6

---

1 5

1 2

3

IN this ſecond *Operation*, I make a *Dot* under the 5, the next *Figure* in the *Dividend*, and place it by the Side of the 1, which remain'd, making it 15; and then I inquire, *how many times* 6 the *Diviſor* is contain'd in 15; which being *twice*, I ſet down 2 in the *Quotient*, and ſay; twice 6 is 12, which I ſet under the 15, and *ſubtract* the 12 from the 15, which leaves 3, and completes the ſecond *Operation*.

The

The third or laſt Operation.

Dividend
Diviſor 6 (7 5 8 (126 *Quotient.*
6
1 5
1 2
3 8
3 6
2 *Remainder.*

HERE again I make a *Dot* under the 8, the next Figure in the *Dividend*, and bring it down to the Side of the 3, which gives 38 to be divided by 6; then asking *how many times* 6 is contained in 38, which is 6, I ſet down 6 in the *Quotient*, which *multiplied* into the *Diviſor* 6, gives 36, to be ſet down under the 38, and *ſubtracted* from it, leaves 2; and having no more *Figures* in the *Dividend* to bring down, the Sum is completed; giving the *Quotient* 126, and the *Remainder* 2.

Another Example by a ſingle Figure.

Suppoſe 4372 Pounds *to be equally parted among* 8 Perſons, it is required *to tell each one's Share.*

The firſt Operation.

Dividend.
Diviſor 8) 4 3 7 2 (5 *Quotient.*
4 0
3

I SEE that 8 the Diviſor is not contained *once* in 4, the firſt ***Figure*** of the ***Dividend***; and therefore I am obliged to aſk, *how many times* 8 there is in 43 (making my firſt ***Dot*** under the 3); which finding to be 5 times, I ſet down 5 in the *Quotient*, and *multiply* it into 8, the Diviſor, which gives 40, to be ſet down under the 43, and *ſubtracted* from it, which leaves 3, and completes the firſt *Operation*.

The ſecond Operation.

Dividend.

Diviſor 8) $4\underset{\cdot}{3}\underset{\cdot}{7}2$ (54 *Quotient.*

40

37

32

5

To perform this ſecond *Operation*, I make a ***Dot*** under the 7, the next Figure to be brought down, and ſet it by the Side of the 3, making it 37; then I inquire, *how many times* 8 it contains; which being 4 times, I ſet 4 in the *Quotient*, and *multiply* it into 8 the *Diviſor*, gives 32, to be ſet down under the 37; and being *ſubtracted* it leaves 5, to begin

The laſt Operation.

Dividend.
Diviſor 8) 4372 (546 *Quotient.*
40
———
37
32
———
52
48
———
4 *Remainder.*

I begin this third *Operation*, by ſetting a *Dot* under this laſt Figure in the *Dividend*, and bringing it down to the Side of the 5, making it 52; which containing 6 times 8 the *Diviſor*, I ſet 6 in the *Quotient*, and *multiply* it into the *Diviſor* 8, produces 48; which ſet down under the 52, and *ſubtracted* from it, gives 4, the *Remainder:* So each *Perſon* will have 546 *Pounds* for his Share, and 4 *Pounds* among the 8, which is 10 *Shillings* to each.

THESE two *Examples* of *Diviſion* by a ſingle *Figure*, I have wrought, and explained at large, to give the Learner a clear, diſtinct, and perfect Notion of the Way to perform *Diviſion*; but before I proceed to any *Examples*, that have two, or more *Figures* in the *Diviſor*, I ſhall ſtate theſe two Queſtions again, to ſhew you how all *Diviſions* by a ſingle *Figure* may be performed ſooner.

	Firſt Example.		*Second Example.*
Diviſor.	*Dividend.*	*Diviſor.*	*Dividend.*
6	| 758 (2 *Rem.*	8	| 4372 (4 *Rem.*
	126 *Quotient.*		546 *Quotient.*

To explain the firſt of theſe *Examples*; obſerve, I ſay the 6 in 7 is *once*, and 1 over (which I ſuppoſe in my Mind join'd to the 5, making it 15); after I have ſet down 1 under the 7, I ſay, the 6 in 15, is *twice*; I ſet 2 under the 5, and as twice 6 is but 12, which is 3 leſs than 15; I carry in my Mind the 3 over to the 8, to make it 38, and then ſay; the 6 in 38 will go 6 times; which 6 I ſet under the 8, and ſeeing 6 times 6 make but 36, which wants 2 of 38, I ſet the 2 at the End, as the *Remainder*; which ſhews as above, 126 in the *Quotient*, and 2 *Remainder*.

Suppoſe there be 9965 Pounds *to be equally divided amongſt* 78 Perſons, *How much ſhall each one have for his Share?*

The firſt Operation.

```
                 Dividend.
     Diviſor 78 )  9965  ( 1  Quotient.
                   78
                  ----
                   21
```

SEEING the *firſt Figure* in the *Dividend* is larger than the *firſt Figure* in the *Diviſor*, I ask *how many times* 7 is contained in 9; which being *once*, I ſet down 1 in the *Quotient*, and ſay; once 8 is 8; which being the *ſecond Figure* of the *Diviſor*, is ſet under the *ſecond Figure* of the *Dividend*; and once 7 is 7, to be ſet under the 9, the *firſt Figure* of the *Dividend*; then *ſubtracting* 78 from the 99, leaves 21 below; and to *prove* whether this *firſt Operation* be right, *add* the 21 which remain, to the 78 above it; and if they make juſt 99, it is right; and if not, it is wrong.

The

The ſecond Operation.

Dividend

Diviſor 78) $99\underset{.}{6}\underset{.}{5}$ (12 *Quotient.*

78

216

156

60

In every Operation you muſt bring down the next *Figure* of the *Dividend*, and for every ſuch *Figure* brought down, you muſt have a *Figure* more in the *Quotient*; ſo in this ſecond *Operation* you make a *Dot* under the 6, and bring it down to the Side of the 21, which remain'd of the foregoing *Operation*, making 216; then as there are three *Figures* in this *Operation*, to be divided by but two, you muſt ſay; *how many times* is 7, the *firſt Figure* of the *Diviſor*, contained in 21, the two *firſt Figures* of the 216, to be divided, which I find to be exactly 3 times; but before I ſet down the 3 in the *Quotient*, I run over in my Mind, ſaying; 3 times 8 is 24, ſuppoſe the 4 ſet under the 6, and the 2 carried to 3 times 7, makes 23, which would be 234, to be *ſubtracted* from 216, which cannot be done, ſince a *larger Number* can never be taken out of a *leſs*; then I find I muſt not ſet down 3 in the *Quotient*, wherefore I ſet 2, and *multiply* it into the *Diviſor*, ſaying; twice 8 is 16; I ſet down the 6 under the 6 in the 216, and carry the 1 *Ten* to twice 7, making it 15, which I ſet under the 21, and then *ſubtract* the 156 from the 216, which leaves 60. To *prove* if this *Operation* be right, before I proceed to the next, I *multiply* the *Diviſor* 78 by 2, the laſt *Figure* I ſet down in the

Quotient, and take in the 60, which remain at Bottom; and finding it makes juſt 216 the *Sum*, that was to be divided in this laſt *Operation*, I am ſure it muſt be right.

The third or laſt Operation.

```
             Dividend
Diviſor 78)  6965   (127  Quotient.
             78
            ----
             216
             156
            ----
              605
              546
            -----
               59  Remainder.
```

To perform this third *Operation*, I aſk, *how many times* 7, the firſt *Figure* of the *Diviſor* is contained in 60, which is 8 times; wherefore I examine ſecretly with myſelf, whether I muſt ſet down 8 in the *Quotient*; ſaying; 8 times 8 is 64, ſuppoſe 4 ſet under the 5, and 6 *Tens* carried to 8 times 7 make 624, to be *ſubtracted* from 605; which cannot be done, it being too much; therefore I find I muſt ſet down but 7 in the *Quotient*, which multiplied into the *Diviſor* gives 546, to be *ſubtracted* from 605, and leaves 59 the *Remainder*, which completes the *Diviſion*, ſhewing that each Perſon is to have 127 *Pounds*, and the 78th Part of 59 *Pounds*.

IN working any *Sum* in *Diviſion* after the *Italian Method*, it may be very proper for young Beginners to draw up a *Table*, or *Tarif*, after the following *Method*, eſpecially if the *Diviſors* be large, and ſeveral *Figures* be required in the *Quotient*, as in the Example following.

Let 532991986 Pounds *be divided amongſt* 745 Men.

	Diviſor.	*Dividend.*	*Quotient.*
1	745	532991986	(715425
2	1490	5215	
3	2235		
4	2980	1149	
5	3725	745	
6	4470		
7	5215	4041	
8	5960	3725	
9	6705		
		3169	
		2980	
		1898	
		1490	
		4086	
		3725	
		361 *Remainder.*	

THIS *Table* you may plainly ſee is thus made; by doubling the *Diviſor*, you get the *Number* over againſt the 2; by adding together the *Number* over-againſt the 1 and 2, you have the *Number* over-againſt the 3: By adding the *Numbers* over-againſt the 3 and 1, or twice the *Number* over-againſt the 2, you have the *Number* that ſtands over-againſt the 4; adding the *Numbers* together, which ſtand over-againſt the 3 and 2, gives the *Number* over-againſt the 5, *&c.* or elſe *multiplying* the *Diviſor* by each reſpective *Digit*, gives the *Number* over-againſt it.

IN working the *Queſtion*, you ſee the firſt *Figure* of the *Dividend* is not ſo large as the firſt *Figure* of

the

the *Diviſor*; and therefore, ſince it will require four *Figures* of the *Dividend* for the firſt *Operation*, I make a *Dot* under the firſt 9 to the Left-hand, and then look down the *Table*, to ſee what *Number* is the neareſt under 5329, which I preſently diſcern to be the 5215, over-againſt the 7; I then ſet down 7 in the *Quotient*, and 5215 under the 5329 in the *Dividend*, and *ſubtract* the one from the other, which leaves 114, to which I bring down the next *Figure* in the *Dividend*, after I have made a *Dot* under it, which makes 1149. I then inquire what *Number* in the *Table* is next leſs, which being the *Diviſor* itſelf, I ſet down 1 in the *Quotient*, and 745 under the 1149, and *ſubtract* from it, leaves 404, to which I join the next *Figure* in the *Dividend*, after I have made a *Dot* under it, which gives 4041; then I ſeek what *Number* in the *Table* is next leſs, which is the 3725, over-againſt the 5; then I ſet down 5 in the *Quotient*, and 3725 under the 4041, and *ſubtract* from it, &c.

The ſhort ITALIAN *Method.*

LET us again *divide* 9965 by 78.

THE Sum to be *divided* I ſet over a Line, and the *Diviſor* on one Side with a Separation, as you may ſee here below.

Dividend 9965 { 78 *Diviſor.*

216 } $127\frac{59}{78}$ *Quotient.*
605

Remainder 59

HAVING inquired as above, and found that 99 does not contain *twice* 78, I ſee however that it does contain it *once*; which 1 I ſet down in the *Quotient*, under the *Diviſor:* Then by a private *Subtraction*, I take away once the *Diviſor* 78 from 99 in the *Dividend*; and ſet underneath the *Remainder* 21. Afterwards I bring down the 6 which is next to the 99, and ſet it down, joining it to the Side of the 21, which gives 216, to be *divided* by 78 in the ſecond *Operation*. Then having ſought and found out the ſame, in like manner as before, that 216 contains but *twice* the *Diviſor* 78; I ſet down 2 in the *Quotient*; and then ſay, 2 times 8 is 16, which taken from 16, leaves 0 under the 6; and I keep in mind the *Ten* which the 6 has borrow'd. Then proceeding to the 7 in the *Diviſor*, I ſay; 2 times 7 is 14, and 1 that I carry makes 15, which taken from 21 leaves 6; which I join to the 0 following, makes 60; at the End of which I ſet down the 5 I brought from at Top, which gives 605 to be *divided* ſtill by 78, for the third *Operation*.

LASTLY, I inquire, as I did in the foregoing *Examples*, by little and little, to find out *how many times* 78 is contained in 605, which I find to be 7 times; and after having ſet down the 7 in the *Quotient*, I ſay; 7 times 8 is 56, taken from the 5, which has borrow'd 6 *Tens* of the 60 to make it 65, and there remains 9: The 6 *Tens* I carry which the 5 borrow'd, in ſaying; 7 times 7 is 49, and 6 that I carry makes 55; which taken from 60, leaves 5 below, by the Side of the 9, and makes the *Remainder* in all 59. The *Proof* is wrought along with the *Sum*, in like Manner as before.

THIS *Italian Method* requires the feweſt *Figures* of any kind of *Diviſion* whatever, becauſe the *Diviſor* is ſet down but once; and the Product of every *Figure* in the *Quotient* with the *Diviſor*, is wrought by Memory; which is the only Reaſon that makes it ſo ſhort, and ſo pleaſing to a great many People: Beſides, ſay they, here are no *Figures* to be *cancell'd*, and one may trace the *Work* over again, if one ſhould be miſtaken: Which we acknowledge, but then the *Diviſor* not being under the *Dividend*, you are longer in finding the *Quotient*, and run a much greater Hazard of being miſtaken: Whereas when the *Diviſion* is large, you are three times as long as in the *Spaniſh Method*; in which you may alſo work back again according to our Author's *Method*, which ſeems to him the clevereſt, and the moſt expeditious of all.

DIVISION *after the* Spaniſh Method.

The firſt Example.

Suppoſe there be 9965 Pounds, *to be equally divided amongſt* 78 Perſons; *how much ſhall each one have for his* Share?

The firſt Operation.

Remains 21

Upon one Line I ſet the *Dividend* $\cancel{9}\cancel{9}65$ } *Quot.* 1.

Under 99 I place the : . *Diviſor* $\cancel{7}\cancel{8}$

THE two Figures following the 99 I let alone, and inquire *how many times* the 78 below, are contain'd in the 99; which finding to be *once*, I ſet down 1 in the *Quotient*; and then ſay; *once* 8 from 9, and there *remains* 1, *cancelling* the 8 and 9 as I nam'd them; I then come to the 7, and ſay alſo; *once* 7 from 9 and there *remains* 2; which I ſet down at Top, after having *cancelled* the 7 and 9 as I named them: Which completes the firſt *Operation*. But to *prove* if it be right; I ſee whether the 21 that *remains*, added to the *Diviſor*, make up the 99 which is cancelled; and finding they do, I am ſure I have made no Miſtake: Wherefore I think of working the ſecond *Operation*; and I ſet down again the *Diviſor* 78, advancing it a Figure forwarder; as you may ſee in the following *Operation*.

The Second Operation.

IN the firſt *Operation*, we took no notice of the two *Figures* following the 99.

$$\left.\begin{array}{lcccc}
 & & 6 & & \\
\text{2d } \textit{Dividend} & \cancel{2} & \cancel{1} & 0 & \\
\text{1ſt } \textit{Dividend} & \cancel{9} & \cancel{9} & \cancel{6} & 5 \\
\cline{2-5}
\text{1ſt } \textit{Diviſor} & \cancel{7} & 8 & & \\
\text{2d } \textit{Diviſor} & & \cancel{7} & 8 &
\end{array}\right\} \begin{array}{c}\textit{Quotient}\\ 12\end{array}$$

IN this ſecond, we leave the laſt *Figure*, which is a 5, for the third or laſt Operation; and we take in only the 6 which ſtands before it, and that with the 21 that *remain'd* makes 216, to be now *divided* by the 78, which is ſet down a ſecond time.

THE firſt thing to be inquired, is *how many times* the 7 of the ſecond *Diviſor*, is contain'd in the 21 that *remain'd*; which I find to be 3 times, but I do not ſet it down in the *Quotient*, nor touch any *Figure*, till I have ſaid to myſelf, 3 times 7 is 21, which taken from the 21 at Top, leaves nothing to be lent to the 6, to pay the 3 times 8, which is 24: Then I find I muſt not ſet down 3 in the *Quotient*; for it is plain that 216 is not equal to 3 times 78, but it contains it *twice* and ſome over: Wherefore I ſet down 2 in the *Quotient*, by which I *multiply* the 78, and *ſubtract* the *Product* from the 216 at Top, and place the *Remainder* above it; which is done after this Manner, ſaying; twice 8 is 16, which taken from the 16 at Top, *leaves* 0, over the 6, which I *cancel* as I name it, after having *cancell'd* the 8 below, and carry the *Ten* which I borrow'd, to pay the 2 times 8 or 16.

THEN coming to the 7, I ſay; 2 times 7 is 14, and 1 *Ten* that I carried makes 15; which taken from the 21 at Top, *remain* 6, to be ſet down above, after having *cancell'd* the 7, and the 21, as I named them: Thus is my ſecond *Operation* finiſhed; and to find if it be right, I *multiply* the *Dividend* 78, by the 2, which I juſt now plac'd in the *Quotient*, ſaying; twice 8 is 16, and 0 over, makes it but 16; the 6 that is *cancelled* is under the *Cypher*, and I carry away the 10 to 2 times 7, 14, which makes it 15, added to the 6 above is 21; the 1 which I have cancell'd is under the 6, and the 2 *Tens cancell'd* are more towards the Left-hand.

The third or laſt Operation.

	$\cancel{6}5$	
	$\cancel{2}\cancel{1}\cancel{0}9$	
Dividend . . .	$\cancel{9}\cancel{9}\cancel{6}\cancel{5}$	*Quotient*
Firſt Diviſor . .	$\cancel{7}\cancel{8}$.	$127\frac{59}{78}$
Second Diviſor . .	$\cancel{7}\cancel{8}$.	
Third Diviſor . .	$\cancel{7}\cancel{8}$	

TO perform this third and laſt *Operation*, I inquire, *how many times* the *Diviſor* 78, ſet down a third time, is contain'd in the *remaining* 605; which being difficult to find at once, I proceed by degrees, and firſt find how many times the 7 at Bottom is contain'd in the 60 at Top; which is 8 times and ſome over; but without touching a Figure, or ſetting down any thing in the *Quotient*, I ſay to myſelf; 8 times 7 is 56, which taken from 60, leaves 4, which makes the 5 following to be call'd 45; after that I come to the 8, and ſay; 8 times 8 is 64, which is more than 45, whereby I ſee that I ought not to ſet down 8 in the *Quotient*, ſince 605 is not equal to 8 times 78; but afterwards finding that it is full 7 times 78, I ſet down 7 in the *Quotient*, by which I *multiply* the *Diviſor* 78, ſaying; 7 times 8 is 56, which taken from the 5 at Top, that has borrow'd 6 *Tens* to make it 65, *leaves* 9 over the 5, after having *cancell'd* both that, and the 8 as you name them, you muſt carry the 6 *Tens*, which the 5 had borrowed.

LASTLY, Coming to the 7, I ſay alſo; 7 times 7 is 49, and 6 that I carry, makes 55; which taken from the 60 at Top, leaves a 5 over the 0, which I *cancel* with the 6, and the 7 which is at Bottom; which completes our *Diviſion*.

THE two firſt *Operations* have been prov'd as we went along, and found to be right: To prove that this laſt is right alſo, I multiply the *Diviſor* 78, by the laſt Figure, which I ſet in the *Quotient*, ſaying; 7 times 8 is 56, and 9 that *remains* makes 65; the 5 *cancell'd* is plac'd under the 9, and the 6 *Tens* I bear in mind: Then coming again to the 7, I ſay; 7 times 7 is 49, and 6 *Tens* that I carried, makes 55; which with the 5 that *remain'd*, makes 60; the 0 is *cancell'd*, and plac'd under the 5; and the 6 is ſet on one ſide of the 5: So 78 *Perſons* having 9965 *Pounds* to be equally divided among them, have each 127 *Pounds*, and there are 59 *Pounds remaining*, which not being a *Pound* a-piece for every one; I draw a little Line at the End of the *Quotient*, and ſet the 59 over at Top, and the *Diviſor* 78 underneath; which gives a *Fraction*, denoting that each *Perſon*, who has already 127 *Pounds*, ought ſtill to have more than that, 59 times the 78th Part of a *Pound:* But this you will better underſtand, when you have ſtudied the *Treatiſe of Fractions* hereafter: Whoever is Maſter of theſe three *Operations*, will be able, with Expedition, to do the hardeſt *Sums* in *Diviſion*, by this Method.

You ſee I have us'd the ſame *Example* here, which I had wrought before in the *Italian Method*, that the two *Methods* may the more eaſily be compared together.

Other Examples in DIVISION *after the* Spaniſh *Method.*

Second Example.

Or thus:

$$\begin{array}{rr}
 & \cancel{5}5 \\
 & \cancel{3}\cancel{3}\cancel{0}5 \\
\textit{Dividend} & \cancel{8}\cancel{9}\cancel{0}\cancel{3}4 \\ \hline
\textit{Divisor} & \cancel{5}\cancel{6}\cancel{0}\cancel{0}\cancel{0} \\
 & \cancel{5}\cancel{6}\cancel{6} \\
 & \cancel{5}
\end{array}
\left\{\begin{array}{c}
\textit{Quotient} \\ 158 \\ 560
\end{array}\right.
\qquad\qquad
\left|\begin{array}{r}
\cancel{5}5 \\
\cancel{3}\cancel{3}\cancel{0}5 \\
\cancel{8}\cancel{9}\cancel{0}\cancel{3}4 \\ \hline
\cancel{5}\cancel{6}\cancel{0} \\
\cancel{5}\cancel{6}\cancel{0} \\
\cancel{5}\cancel{6}\cancel{0}
\end{array}\right.
\left\{\begin{array}{c}
158
\end{array}\right.$$

$$\begin{array}{rr}
 & \hline
 & 9480 \\
 & 790.. \\
\textit{Add the Overplus} & ..554 \\ \hline
\textit{Proof} & 89034 \\ \hline
\end{array}$$

Third Example.

$$
\begin{array}{lr}
 & \cancel{2}\cancel{5}0 \\
 & \cancel{6}8\cancel{4}\cancel{7}0 \\
\textit{Dividend} & \cancel{5}\cancel{4}\cancel{3}\cancel{9}\cancel{7}\cancel{0} \\
\hline
\textit{Diviſor} & \cancel{9}\cancel{5}\cancel{5}\cancel{5}\cancel{5} \\
 & \cancel{9}\cancel{9}\cancel{9}
\end{array}
\left\{
\begin{array}{lr}
\textit{Multiply the} & \\
\quad\textit{Quotient} & \\
 & 5726 \\
\text{by} & 95
\end{array}
\right.
\ \textit{Diviſor.}
$$

$$
\begin{array}{lr}
 & 28630 \\
 & 51534\cdot \\
\hline
\textit{Proof} & 543970 \\
\hline
\end{array}
$$

HERE inſtead of ſetting the *Diviſors* down in different *Lines*, they are placed in the ſame Manner, as the *Remainders* are above the *Line*; which will be clear enough to any who underſtand the former Example.

To prove theſe two laſt *Diviſions*, I have *multiplied* the *Quotient* of each by its *Diviſor*, and *added* to the *Product*, the *Remainder* of the firſt *Sum*, to make the *Total* equal to the *Dividend*, to let you ſee that it is a long Way about to wait till the *Diviſion* be finiſh'd, and then to prove it by a *Multiplication*, as large as the *Diviſion* itſelf: Whereas if one ſhould be miſtaken ſomewhere about the Beginning, you cannot perceive it till you have done both the *Sum* and *Proof*; and then you muſt begin afreſh to do both the *Sum* and *Proof*, which is a Diſcouragement to young Beginners, and cauſes them a great deal of Trouble, as well as makes them loſe a great deal of their Time: To avoid which, let them always prove every *Operation*, as we have ſhewn in our firſt *Example* of *Diviſion*; which is the readieſt, the ſhorteſt, and the beſt Method,

thod, and which no one hath yet made publick, as we know of.

Remarks to be made upon the two laſt Examples.

1. WHEN the *firſt Figure* of the *Dividend* on the Left-hand, is larger than the *firſt Figure* of the *Diviſor*; you muſt put the *firſt Figure* of the *Diviſor*, under the *firſt Figure* of the *Dividend*, ſince it is of greater Value: But if the *firſt Figure* of the *Dividend* be not ſo large as the *firſt Figure* of the *Diviſor*; then put the *firſt Figure* of the *Diviſor*, under the *ſecond Figure* of the *Dividend*, and the others following it in their Order, if there be any; as in the *third Example* above.

2. AFTER you have completed each *Operation* of the *Diviſion*, if what *remains* for the next *Operation*, be not ſo much as the *Diviſor*, which is plac'd below; you muſt ſet a o in the *Quotient*, and cancel the *Diviſor*; and if your *Diviſion* be not finiſh'd, ſet down your *Diviſor* again, advancing it a *Figure* forwarder towards the Right-hand.

3. WHAT *remains* after each *Operation* is completed, muſt always be leſs than the *Diviſor*, which is *cancell'd* below; otherwiſe the Work is falſe.

4. YOU muſt always have exactly as many Figures in the *Quotient*, as the *Number* of times the *Diviſor* is ſet down in working the *Queſtion* after the *Spaniſh Method*; or as there are *Dots* under the *Dividend* in the *Italian Method*.

A Compendious Way of Diviſion.

WHENEVER the *firſt Figure* of the *Diviſor* is 1, and all the reſt are o's, then cut off as many *Figures* of the *Dividend* on the *Right-hand*, as there are o's after the *Unit* in the *Diviſor*: The *Figures* on the

Left-hand Side of the Separation are the *Quotient* of the *Diviſion*; and the *Figures*, or *Cyphers*, on the *Right-hand* of the Separation, are the *Remainder*.

Example.

To *divide* 24 by 10; I ſeparate or cut off only the 4, which will be the *Remainder*, from 2 the *Quotient*, after this Manner; 2 | 4, 4 is the *Remainder*, and 2 the *Quotient*: Under the *Remainder* 4, I ſet 10 the *Diviſor*, and the *Quotient* will ſtand thus $2\frac{4}{10}$.

To *divide* 389 by 100; I ſeparate the 3 from the 89, which is the *Remainder* of the *Diviſion*, and the 3 is the *Quotient*: After which I ſet the *Remainder* 89 over a Line in *little Figures*, and the *Diviſor* below in this manner, $3\frac{89}{100}$, which is the whole *Quotient*.

In a word, if you have 10 *Cyphers* following the *Unit* of the *Diviſor*, you muſt act in like Manner, by cutting off the 10 laſt *Cyphers*, or *Figures* of the *Dividend* on the *Right-hand*, which are the *Remainder* of the *Diviſion*; and the *Figures* on the *Left-hand* will always be the *Quotient*.

From whence we may conclude, that if to *divide* by 10, we need only cut off, or ſeparate the *laſt Figure* of the *Dividend* on the *Right-hand*, to have the *Quotient* on the *Left*: In like manner, if you are to *divide* by 20, you need but ſeparate the *laſt Figure* of the *Dividend*, and take the *Half* of what is on the *Left-hand* of the Separation, which gives the *Quotient*; or take the *Third* Part, if you *divide* by 30; or the *Fourth* Part, if by 40; and ſo on for other *Numbers*.

You muſt act according to the ſame Reaſon when you *divide* by 100, 200, 300, 400, *&c.* or by 1000, 2000, 3000, *&c.* as by 10, 20, 30, 40, *&c.* in ſeparating always as many *Figures* at the End of the *Dividend*, as there are 0's at the End of the *Diviſor*; to gain the *Quotient* on the *Left-hand* of the Separation, and the *Remainder* on the *Right*.

WHEN the *Diviſor* has ſeveral ſignificant *Figures* before the *Cyphers*, you muſt cut off the o's in the *Diviſor*, and as many *Figures* from the *Right-hand* of the *Dividend*; then *divide* the remaining *Figures* in the *Dividend*, by the remaining *Figures* in the Diviſor: If there be any *Remainder*, ſet the *Figures* cut off from the *Dividend* to the *Right-hand* of it, and place the Whole above a Line, ſetting the whole *Diviſor* under it.

Example.

TO *divide* 58784 by 1700, cutting off two *Cyphers* from the *Diviſor*, and two *Figures* from the *Dividend*, there *remain* 587 to be *divided* by 17, which gives 34 in the *Quotient*, and 9 for a *Remainder*; to which I join 84, the two *Figures* cut off from the *Dividend*, and ſet the whole *Diviſor* 1700 under them, with a *Line* betwixt them; thus the whole *Anſwer* is $34\frac{984}{1700}$.

DIVISION *after the Manner of the* Portugueſe.

LET us again make uſe of this *Example*.

The firſt Operation.

$$\text{Dividend}\ \begin{array}{c} 21 \\ \cancel{9}\cancel{9}65 \\ \hline \cancel{7}\cancel{8} \end{array} \left\{ \begin{array}{l} 78\ \text{Diviſor} \\ \hline 1\ \text{Quotient.} \end{array} \right.$$

THE *Sum* to be *divided* I ſet over a Line, and the *Diviſor* at one End, as in the ſhort *Italian* Method:

Then I inquire as above, *How many times* 78 the *Diviſor* is contain'd in 99; which having found to be once, I ſet down 1 in the *Quotient*; and afterwards placing 78 under the 99, I *ſubtract* it from the 99, and ſet down the *Remainder* 21 above; after having *cancell'd* the 78 and 99. To prove it, I ſee whether the 21 that is at Top, *added* to the 78 at Bottom, makes up juſt the 99 in the Middle.

The ſecond Operation.

$$\begin{array}{cccc} & 6 & & \\ \cancel{2} & \cancel{1} & 0 & \\ \cancel{9} & \cancel{9} & \cancel{6} & 5 \\ \hline \cancel{7} & 8 & \cancel{6} & \\ \cancel{1} & \cancel{5} & & \end{array} \left\{ \begin{array}{l} 78 \ \textit{Diviſor.} \\ \hline 12 \ \textit{Quotient.} \end{array} \right.$$

IN the ſecond *Operation* I inquire, (as before by little and little) *how many times* the *Diviſor* 78 is contained in the three *firſt Figures* that *remain* after the firſt *Operation*, *viz.* in 216; which having found to be twice, I ſet down 2 in the *Quotient*; by which I multiply the *Diviſor* 78, and ſet down the *Product* 156, under 216; as you may obſerve in this ſecond *Operation*: Afterwards I *ſubtract* the 156 from the 216, and ſet down the *Remainder* 60, after having *cancell'd* the 156 and 216. To *prove* this ſecond *Operation*, I add the 156, to the 60 that is at Top, to ſee whether they amount to the 216, that is *cancell'd* below.

The third Operation, *or the whole Sum.*

$$\left.\begin{array}{cccc} & \cancel{6} & 5 & \\ \cancel{2} & \cancel{1} & \cancel{0} & 9 \\ \cancel{9} & \cancel{9} & \cancel{6} & \cancel{5} \\ \hline \cancel{7} & 8 & \cancel{6} & \cancel{6} \\ \cancel{1} & \cancel{5} & \cancel{4} & \\ & \cancel{5} & & \end{array}\right\} \begin{array}{l} 78\ \textit{Diviſor.} \\ \hline 127\,\frac{59}{78}\ \textit{Quotient.} \end{array}$$

IN this third *Operation*, I inquire exactly after the ſame Manner as in the former *Methods*, *how many times* the *Diviſor* 78, is contained in the 605 that remain after the ſecond *Operation*; and having found it to be 7 times, I ſet down 7 in the *Quotient*, by which I multiply the *Diviſor* 78, and ſet down the *Product* 546 under 605; then I ſubtract 546 from 605; and after having *cancell'd* theſe two *Sums*, I place at Top the 59 that *remains*; and afterwards I ſet it down in little *Figures*, above a Line at the End of the *Quotient*, and the *Diviſor* 78 below the Line.

TO prove this laſt *Operation*, I add 546 at Bottom, with the *Remainder* 59, which is at Top, to ſee whether they make up the 605, that I laſt *cancell'd*.

THIS *Diviſion* may alſo be prov'd at once; in adding up all the Figures, that are cancell'd below the *Dividend*, with 59 the *Remainder*, which ſhould amount to the *Dividend* 9965.

Some chuſe to ſet down the whole *Work* and *Proof* in this *Form.*

$$\begin{array}{r}
\cancel{6}5 \\
\cancel{2}\cancel{1}\cancel{0}9 \\
\cancel{9}\cancel{9}\cancel{6}5 \\
\hline
\cancel{7}8 \\
\cancel{1}\cancel{5}\cancel{6} \\
\cancel{5}\cancel{4}\cancel{6} \\
59
\end{array}
\left\{\begin{array}{c}
78 \\
\hline
127\,\frac{59}{78}
\end{array}\right.
\quad \textit{Remainder},$$

$$\overline{9965}\ \textit{Proof.}$$

THIS *Diviſion* having no *Diviſor* plac'd under the *Dividend*, any more than in the *Italian Method*, it is alſo attended with the ſame Inconveniency: We ſhould not have diſtinctly and fully wrought all the *Operations*, in all theſe kinds of *Diviſion*, but that you might gain a better Notion of the Rule; which requiring all the *Operations* in every *Diviſion*, is the moſt difficult to be learnt, and the moſt tedious to be demonſtrated by Writing, of any one of the four FUNDAMENTAL RULES.

THE three Methods of Diviſion which we have juſt now taught, *viz.* The *Italian*, the *Spaniſh*, and the *Portugueſe*, are the beſt, and the moſt in Uſe: But the plaineſt, the eaſieſt, and the moſt commodious for our Purpoſe, is that which we firſt taught; and therefore we ſhall make uſe of no other in the remaining Part of this Book: Upon which account we have been longer in explaining this Method, than the others; which we think are eaſily underſtood, when once the *Italian* is well known; which however may alone ſuffice, ſince there is no occaſion to know more than one Method well, and to uſe one's ſelf to it: For after which Method ſoever you perform your Diviſion, the *Quotient* will be the ſame, and the *Remainder* alſo, if there be any.

THERE are alſo ſeveral other Ways of Diviſion; but they all have ſome relation to one or other of theſe Methods, which we have already explain'd.

THAT which they call the *French Way* is too long, and therefore we have not meddled with it: Their Cuſtom is to inquire in every Diviſion, what *Figures* muſt be plac'd in the *Quotient* in every *Operation*. For which Purpoſe they begin at the *Left-hand*, and after they have found this *Figure*, they place it down in the *Quotient*: Then beginning on the *Right-hand*, they leave off at the *Left*, as is explain'd in the firſt *Example* of *Diviſion* after the *Spaniſh Method*.

THE *Italian Method* may be perform'd, with cancelling the Figures, as in the *Spaniſh*.

IN the *Italian Method*, you may ſet the *Remainder* of every Operation, above the *Dividend*, inſtead of below it; and cancel them alſo, as in the *Spaniſh Method*, if you think beſt. That which they call the *Perſian*, the *Indian Diviſion*, &c. are nothing elſe but the *Italian*, which differs from the *Spaniſh*, only in ſetting down the *Diviſor* but once, and not uſually cancelling the Figures; which is juſt as Perſons fanſy.

THE *Portugueſe* is over the Dividend, exactly the ſame as the *Spaniſh*; and what is below may be left out, as in the ſhort *Italian Method*; but all this is more to pleaſe the Curious, than of real Advantage; for any one of theſe Ways, whichſoever you may chuſe, will anſwer your Purpoſe.

IF what has been ſaid about DIVISION be well underſtood, and you are well vers'd in, and expeditious at, the *Italian Method*; you will find little or no Difficulty in the following TREATISE OF FRACTIONS: After which we ſhall lay down ſuch eaſy Examples, that the meaneſt Capacity may underſtand how to make uſe of all the *Rules* in *Arithmetick*, and to know the Reaſons thereof; and how properly to apply them on different Occaſions, according to the Nature of Things.

A TREATISE OF FRACTIONS.

WHEN two *Numbers* are plac'd one over the other, with a little *Stroke* or *Line* drawn between them, they are called a *Fraction*, or *Broken Number*.

FRACTIONS are ſo called, becauſe they are the *Pieces* of any thing, *divided* into ſeveral *Portions*, or equal *Parts*.

AS *Fractions* then ſignify certain *Pieces* of any thing; ſo *Integers* ſignify Things that are *intire* or *whole*.

THIS therefore it is neceſſary you ſhould remember, becauſe we ſhall have frequent Occaſion hereafter, to mention the Words *Integers* and *Fractions*.

THE *Number* above the *Line* is call'd the *Numerator*, becauſe it *numbers* the *Parts* belonging to the *Fraction*; and that below the *Line*, is call'd the *Denominator*,

nominator, becauſe it gives a *Name* to the *Parts* into which the *Integer* is divided, and denotes, *how many* of them there muſt be to make this *Integer*.

BUT ſince all don't underſtand, or may not be acquainted with, theſe Words, *Numerator* and *Denominator*, we ſhall for their ſakes, call *uppermoſt*, that Number which is *above* the *Line*, and *undermoſt*, that which is *below* it; which *Name* belongs to the *uppermoſt*, for undoubtedly the Number *below* the *Line*, is the Name of that which is *above* it.

IN reading of a *Fraction* there is no Difficulty; for all that you have to do, is firſt to name the *Number above* the *Line*, and afterwards that which is *below* it.

OBSERVE you muſt not ſay, one *Two*, two *Three*, three *Four*; but one *Half*, two *Thirds*, three *Fourths*; which are the only Exceptions to be made.

BUT if when I ſay, two *Thirds*, three *Fourths*, five *Sixths*, &c. you ſhould aſk, what are theſe *Thirds*, theſe *Fourths*, or theſe *Sixths*? To which if I reply, They are *Thirds*, *Fourths*, or *Sixths* of an *Ell*, a *Pound*, a *Fathom*, &c. then the *Sum above* the *Line* would have two *Names*, viz. that of the *Sum below* the *Line*, which is its *proper Name*; and *Ells*, *Pounds*, or *Fathoms*, which would be its *Surname*.

The Names and Significations of FRACTIONS.

$\frac{1}{2}$ One *Half*, a Moiety, or the *ſecond Part* of any thing cut in *two*.

$\frac{1}{3}$ one *Third*, or the *third Part* of any thing whatever.

$\frac{1}{4}$, one *Fourth*, or the *fourth Part* of an *Unit* (or *whole* thing) equally divided into 4 *Pieces*.

$\frac{1}{5}$, one *Fifth*, or the *fifth Part* or *Portion* of an *Unit*, or *Integer*, divided into 5 *equal Parts*.

$\frac{1}{6}$, one *Sixth*, or the *ſixth Part* of any thing put into 6 *equal Shares.*

$\frac{1}{7}$, one *Seventh*, or the *ſeventh Part* of an *Integer* ſeparated into 7 *equal Lots.*

$\frac{1}{8}$, one *Eighth*, or the *eighth Part* of any thing divided by 8.

$\frac{1}{9}$, one *Ninth*, or the *ninth Part* of any thing parted into 9 *equal Shares.*

$\frac{1}{10}$, one *Tenth*, or the *tenth Part*, or *one Lot* of any thing divided by 10.

$\frac{2}{3}$, two *Thirds*, or *two* times the *third Part* of any thing divided by 3.

$\frac{3}{4}$, three *Quarters*, or *three Fourths*, or *three* times the *fourth Part* of an *Integer* put into 4 *equal Lots.*

$\frac{9}{12}$, nine *Twelfths*, or *nine* times the *twelfth Part* of any thing divided into 12 *Parts*, of which this has *nine.*

$\frac{18}{24}$, eighteen *Twenty-fourths*, or *eighteen* times the *twenty-fourth Part* of any thing whatever, that ſhall be divided, or put into *twenty-four* equal *Parts.*

$\frac{239}{240}$, two hundred and thirty-nine *two hundred and fortieths*, the 239, 240*ths*, or 239 times the 240*th Part* of any thing ſhared, or divided into 240 *equal Parts.*

3 $\frac{2}{5}$, is pronounced, *three and two Fifths*, or *three Integers*, or *Units*, *and two Fifths* of one of thoſe three *Integers.*

6 $\frac{2}{3}$, is call'd *Six and two thirds*, or ſix *Integers*, and *twice* a *third Part* of one of thoſe *ſix.*

192 $\frac{8}{15}$, is read 192 and 8 15*ths* of one of thoſe 192, *&c.*

THE *undermoſt* of a *Fraction*, always declares the *Number* of Parts, or Pieces, into which the thing is *divided*; and the *uppermoſt* diſcovers, *how many* of theſe Parts or Pieces the *Fraction* does contain.

ALL *Fractions* are found to be in ſome one of the three following Forms.

EITHER the *undermoſt* is larger than the *uppermoſt*, as $\frac{3}{7}$.

OR they are both equal, as $\frac{3}{3}$.

OR laſtly, the *undermoſt* is leſs than the *uppermoſt*, as $\frac{4}{3}$, $\frac{5}{4}$, *&c.*

IN the *firſt* of theſe you ſee, that when the *uppermoſt* is *leſs* than the *undermoſt*, the ***Fraction*** is always *leſs* than *One*, or *Unit.*

2dly, When the *uppermoſt* and *undermoſt* are both alike, the Value of the ***Fraction*** is exactly *one*, neither more nor leſs.

3dly, When the *uppermoſt* is *larger* than the *undermoſt*, the Value of the ***Fraction*** is always *more* than *one*; and in that caſe the true Value is found, in dividing the *uppermoſt* by the *undermoſt*, which ſhews in the *Quotient* what *whole Numbers* it contains, and if any thing remains after the *Diviſion* is finiſh'd, that will be the *uppermoſt* of another ***Fraction***, and the *Diviſor* the *undermoſt*; which plainly diſcovers, that *Arithmetical Fractions* are nothing elſe but the *Remainders* of *Diviſion.*

An Example of $\frac{4}{3}$.

$$\left.\begin{array}{lc}\text{Let us divide the } \textit{uppermoſt} & \underline{4} \\ \text{by the } \textit{undermoſt} \quad . \;\; . \;\; . & 3\end{array}\right\}\text{gives } 1\,\tfrac{1}{3}$$

AND there remains 1 over, which is the *uppermoſt* of another ***Fraction***, whoſe *undermoſt* is always the *Diviſor*, as 3; which is ſet in the *Quotient* by the Side of the *Integer* 1, after this Manner 1 $\frac{1}{3}$: So the Value of $\frac{4}{3}$, is 1 and the *third Part* of 1.

Another

Another Example.

Suppoſe 7 Pounds to be parted equally between 4 Perſons.

$$\begin{array}{rl} 4) & 7 \;(1\tfrac{3}{4} \text{ which is} \\ & \underline{4} \\ & 3 \end{array}$$

1 *Pound* and $\frac{3}{4}$ to each Perſon.

EACH will have 1 *l.* and ſomething over, but not quite ſo much as 2 *Pounds* apiece; yet after each has taken one, there remains 3 over, which is the *uppermoſt* of a *Fraction*, and 4 *Perſons* the *Diviſor* is the *undermoſt*, which gives in the *Quotient* after this Manner, 1 *Pound* and $\frac{3}{4}$ of a *Pound* to each Perſon; or inſtead of $\frac{3}{4}$ of a Pound, you may ſet down its Value 15 *Shillings*; which is found in multiplying 3, the uppermoſt, by 20 *Shillings*, the Value of one *Pound*, which produces 60 *Shillings*; and that divided by 4 the *undermoſt*, gives 15 *Shillings* in the *Quotient*. This is call'd, *Finding the Value of a Fraction*.

Reduction of FRACTIONS.

THERE are *five* Things which ought to be well underſtood, in order to overcome with Eaſe the *Difficulties* of any *Sum* where there are *Fractions*.

THE *firſt* is; To bring a great *Fraction* into its *leaſt* Denomination; and on the contrary, To bring a ſmall one into a *larger* Denomination, without altering its Value.

THE *ſecond* is; To turn *whole Numbers* and *Fractions* all into the ſame *Fraction*; and ſome *Fractions* into *whole Numbers*, and *Fractions*, if there ſhould be any over.

THE *third* and principal one is; To bring ſeveral different *Fractions* all into the ſame *Denomination.*

THE *fourth* is; To find the Value of a *Fraction*, or to ſee how much it is worth in ſome known Term.

THE *fifth* is; To reduce *Fractions* of *Fractions* into *ſimple* or *ſingle Fractions.*

Firſt of all, To bring a *large Fraction* into its *leaſt* Denomination, is to reduce the *uppermoſt* and *undermoſt* into leſs Numbers, without diminiſhing its Value; which is done by taking the ſame *aliquot Part* out of both the *uppermoſt* and *undermoſt*, for another *Fraction.*

Example.

TO turn the *Fraction* $\frac{9}{12}$ into other *leſs* Numbers, you need but examine if you can take the ſame *aliquot Part* of 9, as of 12, in Proportion to their Largeneſs; which finding you can, you take

The *Third Part* of 9, which is 3 } and this
The *Third Part* of 12, which is 4 }
Three Fourths, is equal in Value to $\frac{9}{12}$.

Another Example.

THE *Fraction* $\frac{18}{24}$ may be brought into the *leaſt* Denomination, either at *once*, or at *twice*, after *two* Ways.

At *once*; in taking the *6th* Part of 18, which is 3,
and the *6th* Part of 24, which is 4,
which is three *Fourths.*

At *twice*; By taking
The *Half* of 18, which is 9, the *Third* of which is 3,
The *Half* of 24, which is 12, the *Third* of which is 4,
and this makes three *Fourths* alſo.

OTHERWISE you may take,
The *Third* of 18, which is 6, the *Half* of which is 3, and the *Third* of 24, which is 8, the *Half* of which is 4, which makes three *Fourths* likewiſe.

THUS $\frac{18}{24}$, $\frac{9}{12}$, $\frac{6}{8}$, and $\frac{3}{4}$, are four *Fractions* of equal Value to one another; by which you ſee, that it is no matter what Part you take out of the *uppermoſt* and *undermoſt* of a *Fraction*, provided it be the ſame, and there be nothing remaining of either: But if you can take no *Part* without ſomething remaining, then the Fraction can receive no *leſs* Name, or *Denomination*, nor be any ways *abbreviated.*

SOMETIMES indeed we meet with *Fractions*, that are ſo large and crooked, as one may ſay, that it is not eaſy to ſee what Part you can take out of the uppermoſt and undermoſt without ſome *Remainder*; wherefore we ſhall lay down a general and infallible Rule, to reduce the moſt difficult *Fractions*, if it be poſſible; or to ſhew the Impoſſibility, if they are not reducible.

FOR *Example*; Suppoſe it be unknown, that $\frac{22}{28}$ may be reduced to $\frac{11}{14}$ (which is the loweſt it can be) and you would find which is the *largeſt Number* that can *part* or *divide* 22 and 28, without leaving any *Remainder*; *then obſerve this*

Rule to find the greateſt common Meaſure *to the* uppermoſt *and* undermoſt *of a* Fraction.

Divide the *undermoſt* of the *Fraction* by the *uppermoſt*; if there be any *Remainder*, you muſt make that the *Diviſor* to the laſt *Diviſor*, which now becomes a *Dividend*; and proceed thus, making every *Remainder* a new *Diviſor*, and the laſt *Diviſor* a new *Dividend*, till nothing *remain*; then the laſt *Diviſor* is the *Number* ſought, *viz.* the *greateſt Number*, which can *divide* the *uppermoſt* and *undermoſt* of the *Fraction* without a *Remainder*.

To reduce $\frac{22}{28}$ into its leaſt *Terms*;

Operation.

22) 28 (1
22
6)22(3
18
4)6(1
4
Laſt *Diviſor* 2) 4 (2
4
0

Then

$2\Big)\frac{22}{28}\Big(\frac{11}{14}$ *Anſw.*

Explanation.

I *divide* the *undermoſt* 28 by the *uppermoſt* 22, which gives 1 in the *Quotient*, and leaves the *Remainder* 6: I always neglect the *Quotient*, and make the 6 a new *Diviſor*, and the laſt *Diviſor* 22 a new *Dividend.*

THEN *dividing* 22 by 6, the *Remainder* is 4, which is made a new *Diviſor*, and the laſt *Diviſor* 6 becomes a new *Dividend.*

THIS 6 *divided* by 4, leaves 2 for a new *Diviſor*, and 4 is its *Dividend.*

Dividing 4 by 2, there is no *Remainder*; therefore 2 is the *greateſt common Meaſure*, which can *divide* 22 and 28 without leaving any *Remainder*.

LASTLY, You take 2 the *Diviſor* of the laſt *Diviſion*, in which there was no *Remainder*, and with that *divide* the *uppermoſt* and *undermoſt* of the great *Fraction*, which was to be *abbreviated*, as we have done in the Example, which gives the *Anſwer* $\frac{11}{14}$.

IF after having made ſeveral continued *Diviſions* there remains 1 at laſt, it is plain that the *Fraction* cannot be reduced, nor can have any other common Meaſure than an *Unit*, which makes no Alteration.

NOTE, You muſt obſerve, that you are not to take the ſame *Number* from the *uppermoſt* and *undermoſt* of a *Fraction*, inſtead of the ſame *Part*: As for *Example*, if you was to take 2 from the *uppermoſt*, and 2 from the *undermoſt* of $\frac{22}{32}$, 22 would pay as much as 32, which would be unjuſt; for 22 being leſs than 32, it ought not to pay ſo much

NOTHING can be more eaſy than to make a little *Fraction* as large as you pleaſe, by obſerving the Reverſe of what we have juſt now mentioned; for if you *multiply* the *uppermoſt* and the *undermoſt* of any *Fraction*, by the *ſame* Number, the two *Products* will form another *larger Fraction* of the ſame Value as the *leſſer*.

Example. The Fraction $\frac{2}{3}$, *is deſired to be made 6 times as large without altering its* Value: Wherefore

$$\left.\begin{array}{l} \textit{Multiply } 2 \text{ by } 6\text{, gives } 12 \\ \textit{Multiply } 3 \text{ by } 6\text{, gives } 18 \end{array}\right\}$$ and thus it is twelve *Eighteenths*, inſtead of two *Thirds*.

IN like manner, you may raiſe others to what Largeneſs you pleaſe; but you can neither turn *Thirds* into *Fourths*, nor *Fourths* into *Thirds*, as you may *Twelfths* into *Thirds* and *Fourths*; becauſe 3 times 4, or 4 times 3, is 12, *&c.*

The Second Kind of Reduction.

TO turn *Integers* and *Fractions*, all into one *Fraction*; and alſo *Fractions* into *Integers*, and *Fractions*, if there ſhould be any over:

'Tis eaſy to turn *Integers* into *Fractions*, that is to ſay, *whole Things* into *Pieces*, ſince a *Fraction* ſignifies a *Piece*, or a *Part* of any thing *broken.*

If, for *Example*, *You would turn* 3 Integers *into* Quarters;

Multiply the 3 *Integers* by 4, which is the *Denomination* of *Quarters* or *Fourths*, and you will have

$$\frac{12}{4}\left\{\frac{\text{twelve}}{\textit{Fourths.}}\right.$$

Also 4 *Integers* by 2, which is the *Name* of *Halves*, which gives $\frac{8}{2}\left\{\frac{\text{eight}}{\textit{Halves.}}\right.$

Then 5 *whole Numbers* by 20, which is the *Name* of *Twentieths*, will produce

$$\frac{100}{20}\left\{\frac{\text{an hundred}}{\textit{Twentieths.}}\right.$$

To turn $6\frac{4}{5}$ *all into one* Fraction:

Only *multiply* the 6 *Integers*, by the 5 of the *Fraction* $\frac{4}{5}$, and to the *Product* 30, add 4 the *uppermoſt* makes it 34, and it will be $\frac{34}{5}\left\{\frac{\text{thirty-four}}{\textit{Fifths.}}\right.$

On the contrary, and as a *Proof*; if you would turn *Fractions* into *Integers*, that is to ſay, to make *Whole Things* of *Pieces*, if there be enow of them, you need only join them together. But to make uſe of the four Examples above in order: Divide the *uppermoſt* of the *Fraction* $\frac{12}{4}$, by its *undermoſt*; and you will have in the *Quotient* 3 *Integers*. Divide the *uppermoſt* of the *Fraction* $\frac{8}{2}$, by its *undermoſt* 2, ſhews 4 *Integers* in the *Quotient*. Divide the *uppermoſt* of the *Fraction* $\frac{100}{20}$, by its *undermoſt* 20, diſcovers 5 *Integers* in the *Quotient*. Laſtly, Divide the *uppermoſt* of the *Fraction* $\frac{34}{5}$, by its *undermoſt*, which is 5, and it gives 6 and $\frac{4}{5}$ in the *Quotient*.

THESE eight Examples are exactly the Reverſe, and *Proof* to each other, and may ſerve as a Model to reduce all ſorts of *Integers* into *Fractions*, and *Fractions* into *Integers*, when the *uppermoſt* is greater than the *undermoſt*.

The Third Kind of Reduction.

TO find the *ſame* Name or *Denomination*, to ſeveral different *Fractions*, in order to be able to *add* or *ſubtract* them, or *divide* them by one another.

WHEN there are but two *Fractions* to be brought into the *ſame* Name or *Denomination*, you muſt *multiply* by Turns, the *uppermoſt* of the one by the *undermoſt* of the other, and each *Product* will be a new *uppermoſt*, inſtead of that which was *multiplied*: And to find a new *Name* to theſe two new *Uppermoſts*, you muſt *multiply* the two *Undermoſts* by each other, which will produce a new *Name*, to ſerve both the new *Uppermoſts*.

Example.

TO *bring* $\frac{2}{3}$ and $\frac{4}{5}$ *into one* Denomination; *You muſt work as follows:*

10 and 12 are the new *Uppermoſts*.
$\frac{2}{3}$ and $\frac{4}{5}$
15 is the new *Name*, or new *Undermoſt*.
2 times 5 is 10, ſet at Top on the *Left-hand*.
4 times 3 is 12, ſet above on the *Right*.
And 3 times 5 is 15, ſet *below*.

THUS the $\frac{2}{3}$ and $\frac{4}{5}$, are changed into $\frac{10}{15}$ and $\frac{12}{15}$, which are of the ſame *Value*.

For Proof: Undo what you have now done, by reducing $\frac{10}{15}$ and $\frac{12}{15}$ into their leaſt *Name* or *Denomination*, as is taught in the firſt Kind of *Reduction.*

THIS Way comes to the ſame, as if we had *multiplied* at firſt the two *Undermoſts* 3 and 5, which is 15, of which 2 times the *Third Part* is $\frac{10}{15}$, and 4 times the *Fifth Part* is $\frac{12}{15}$.

BUT if you are oblig'd to bring more than *two Fractions* into one *Denomination*, you may examine within yourſelf, and find out what is the *leaſt* Number, into which they may be *divided* without a *Remainder* to either; and to ſave yourſelf the Trouble of *multiplying* all the *Undermoſts* together.

Example.

YOU ſee that the leaſt *Number* poſſible, that can be *divided* by all the *Undermoſts* of theſe three *Fractions* $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{6}$, and nothing remain, is the *Number* 12; which may be *divided* without any *Remainder* by 2, by 4, and by 6, which are the three *Undermoſts* of our *Fractions:* Wherefore then ſet down this common *Name* 12, over a *Line* in this Manner:

12 the *common Name.*

And for $\frac{1}{2}$, take the *half* of it, which is 6, that is $\frac{6}{12}$.

For $\frac{3}{4}$, take 3 times the *Fourth* of it, which is 9, and makes $\frac{9}{12}$.

For $\frac{5}{6}$, take 5 times the *ſixth Part* of it, which is 10, and gives $\frac{10}{12}$.

$$\begin{array}{r} 25 \end{array}$$

Then *adding* up the three new *Uppermoſts*, 6, 9, and 10, they make 25, that is $\frac{25}{12}$, which are equal to

$$\begin{array}{rl} 12) & 25\ (2\tfrac{1}{12} \\ & \underline{24} \\ & \ \ 1 \end{array}$$

2 *Integers* and $\frac{1}{12}$ over; the *Total* of theſe three *Fractions* join'd together.

BUT in fine, if the *Undermoſts* of the *Fractions* were ſuch, that you could not eaſily find out in your Mind any *Number*, that would be divided by them all without a *Remainder* to any one; then your only Way is, to *multiply* all the *Undermoſts* into one another, and the laſt *Product* will be the *common Name*.

FOR *Example*; *To find a* common Name *to theſe four* Fractions $\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{5}$, and $\frac{5}{7}$:

YOU muſt of neceſſity *multiply* the four *Undermoſts* together, *viz.* 2 by 3 gives 6, 6 by 5 gives 30, and 30 by 7 produces 210, a *common Name* or *Number*, which any one of the four *Undermoſts* may certainly *divide* without any *Remainder*, ſince they have produc'd it by *Multiplication*. Then placing this *common Name* 210, over a Line in this Manner:

	210 *the common Name.*
For $\frac{1}{2}$, let us take the *Half* of it, which is	105, that is, $\frac{105}{210}$.
For $\frac{2}{3}$, let us take 2 times the *Third* of it, which is	140, that is, $\frac{140}{210}$. 70.
For $\frac{4}{5}$, let us take 4 times the *fifth Part* of it, which will be	168, that is, $\frac{168}{210}$. 42.
For $\frac{5}{7}$, let us take 5 times the *ſeventh Part* of it, which will produce	150, that is, $\frac{150}{210}$. 30.
If you *add* them all up together, the *Sum Total* you find amounts to	563 . . 210*th Parts*

of one:

And

$$\text{And } \textit{dividing} \text{ the } \textit{uppermoſt} \left.\begin{array}{r}\underline{563}\\ 210\end{array}\right\} \text{ by the } \textit{undermoſt}$$

will give 2 *Integers*, and $\frac{143}{210}$ of one of theſe ſaid *Integers*.

$$\begin{array}{r}210)\ 563\ (2\\ \underline{420}\\ 143\end{array}$$

Here it may be proper to acquaint you, that you muſt not take all at once the $\frac{2}{3}$, the $\frac{4}{5}$, nor the $\frac{5}{7}$ of 210, which would be too difficult; but firſt take $\frac{1}{3}$ of 210, that is, 70, which ſet down on the Side, and multiply it by the *uppermoſt* of the *Fraction* $\frac{2}{3}$, for which you are taking, which gives 140, to be ſet down in Order under the *common Name*; and then ſtrike out the 70, which is of no further Service. After the ſame manner you muſt work the other two Fractions $\frac{4}{5}$, and $\frac{5}{7}$, and all others on the like Occaſion.

To find the Value of Fractions.

4. In order to find how many ſmaller *Integers* are contained in any *Fraction*, you muſt know how many equal Parts, or Portions, the *Integer* of the Fraction is divided into. For *Example*, a *Crown* of 60 *Pence*, is an *Integer* divided into 60 equal *Parts*. A *Pound* of 20 *Shillings*, is an *Integer* divided into 20 equal *Parts*.

Suppoſe you are deſired to find, how many Pence, $\frac{4}{5}$ *of a* Crown *of* 60 Pence *does contain:* You muſt multiply 4 the *uppermoſt* by 60 *Pence*, which will give 240 *Pence*.

$$\left.\begin{array}{r}5)\underline{240}\\ 48\end{array}\right\} \text{the } \textit{Quotient} \text{ is exactly } 48 \text{ Pence.}$$

Theſe you divide by 5 the *undermoſt*, and you find in the *Quotient* 48 *Pence*, equal in Value to $\frac{4}{5}$ of a *Crown* of 60 *Pence*.

THIS being a general and infallible *Rule*, to find out the Value of all ſorts of *Fractions*, when the equal *Portions* or *Parts* of the *Integer* are known, I ſhall leave this Example as alone ſufficient.

5. TO reduce *Fractions of Fractions* into *ſimple Fractions*, that is to ſay, Pieces of Pieces into ſingle Pieces: You muſt multiply all the *Uppermoſts* together, and ſet their *Product* over a Line, for the *uppermoſt* of a *ſimple Fraction* of an *Integer*: In like manner multiply all the *Undermoſts* together, and ſet down their *Product* under the Line, as an *Undermoſt* to this *ſimple Fraction* of an *Integer*.

Example. *How much is* $\frac{3}{4}$ *of* $\frac{4}{5}$ *of an* Integer?

$$\text{Say, } \left\{ \frac{3}{4} \begin{matrix} \text{times} \\ \text{times} \end{matrix} \frac{4}{5} \right\} \text{ is } \frac{12}{20}, \text{ or } \frac{3}{5} \text{ of an } \textit{Integer}.$$

Another Example. *How much is* $\frac{5}{6}$ *of* $\frac{1}{2}$ *of* $\frac{2}{3}$ *of any* Integer? Anſw. $\frac{5}{18}$.

$$\text{Say, } \left\{ \frac{5}{6} \begin{matrix} \text{times} \\ \text{times} \end{matrix} \frac{1}{2} \begin{matrix} \text{is} \\ \text{is} \end{matrix} \frac{5}{12}, \text{ and } \frac{5}{12} \begin{matrix} \text{times} \\ \text{times} \end{matrix} \frac{2}{3} \begin{matrix} \text{is} \\ \text{is} \end{matrix} \frac{10}{36} \right\}$$

reduc'd to $\frac{5}{18}$ of an *Integer*.

NOW if you would *add*, *ſubtract*, or *divide*, the $\frac{3}{4}$ of $\frac{4}{5}$ of any *Integer*, with $\frac{5}{6}$ of $\frac{1}{2}$ of $\frac{2}{3}$ of the ſame ſort of *Integer*; by this Rule you would preſently ſee, you had only $\frac{3}{5}$ to be *added*, *ſubtracted*, or *divided* by $\frac{5}{18}$.

THESE two *Examples* are ſufficient for all ſorts of *Fractions* of *Fractions*; for they muſt all be wrought after the ſame Manner, if there were twenty of them which depended upon one another: And that you might comprehend the Reaſon of it, which is very plain; Take for your *Integer*, 1 *Pound* of 20 *Shillings*, of which the $\frac{4}{5}$ is 16 *Shillings*, the $\frac{3}{4}$ of which is 12 *Shillings*, which are $\frac{3}{5}$ of one whole *Pound*. Or ſuppoſe you take for the *Integer*, a *Crown* of 60 *Pence*; then the $\frac{4}{5}$ is 48 *Pence*, of which the $\frac{3}{4}$ is 36 *Pence*, which are the $\frac{3}{5}$ of 60 *Pence*. And ſo for others.

Addition of FRACTIONS.

IF you have well obſerv'd what has been already ſaid concerning *Fractions*, you will find no Difficulty in *adding* them together; ſeeing when they have the ſame *Name* or *Denomination*, you muſt only add the *Uppermoſts* together, and place their *common Name*, or Denomination, under the *Sum Total* of the *Uppermoſts*, which forms another great *Fraction*, that is the *Sum Total* of them all together.

Example. Add $\frac{2}{8}$, $\frac{1}{8}$, and $\frac{4}{8}$ together, gives $\frac{7}{8}$, becauſe the three *Uppermoſts* 2, 1, and 4, make 7; under which place 8 their *undermoſt*, and you have $\frac{7}{8}$, the Value of all the three other *Fractions* added together.

Another Example. To *add* $\frac{2}{3}$, and $\frac{3}{4}$ together, we muſt find them one *common Name*; or bring them into one *Denomination*, after this Manner;

3 times 4 is 12, *com. Name.*
Of which we take for $\frac{2}{3}$, two times the *third Part*, which is 8 that is $\frac{8}{12}$.
And for $\frac{3}{4}$, we take three times the *fourth Part* of it, which gives 9, that is $\frac{9}{12}$.
So *adding* 8 and 9 together, makes 17, that is $\frac{17}{12}$.

Now ſince the *Uppermoſt* is larger than the *Undermoſt*, the *Fraction* is more than an *Unit* or *Integer*; wherefore

You muſt divide the *uppermoſt* by the *undermoſt* $\frac{17}{12}$ $\left\{ \begin{array}{l} \text{which gives} \\ \text{1 } \textit{Integer} \\ \text{and } \frac{5}{12}. \end{array} \right.$

Third Example.

		20 *com. Name.*
Let us add	$1\,\frac{1}{2}$.	10 that is, $\frac{10}{20}$.
With	$2\,\frac{1}{4}$.	5 that is, $\frac{5}{20}$.
And with	$3\,\frac{2}{5}$.	8 that is, $\frac{8}{20}$.
which gives in the *Total*	$7\,\frac{3}{20}$.	23 that is $\frac{23}{20}$.

$$20)\,\begin{array}{r} 23 \\ \underline{20} \\ 3 \end{array} \left\{ \begin{array}{l} \textit{Quotient,} \\ 1\,\frac{3}{20} \text{ to be } \textit{added} \text{ to the } \textit{Integers}, \text{ which} \\ \text{makes the Total of the three } \textit{Fractions}\ 7\,\frac{3}{20} \end{array} \right.$$

The *undermoſt* 2 might eaſily be taken out of 4, but neither 2 nor 4 can be taken out of 5, without ſome *Remainder:* Wherefore 4 and 5, which are the two greateſt *Undermoſts*, of which there is but one even, (and ſo can't be *divided* by each other without a *Remainder*) you are oblig'd to multiply together, to find the *common Name* 20.

These Sort of *Sums* are as eaſily prov'd as others, if you remember that every Rule is prov'd by its contrary. And if you would be always ſure that you are right, you muſt *prove* every Part by its contrary as you go along: And here your main Buſineſs is to examine in every *Operation*, which is its contrary.

Subtraction of FRACTIONS.

IN order to take one *Fraction* from another of a greater Value, you muſt ſee that both have the ſame *Denomination*; and then take the *uppermoſt* of the leaſt, from the *uppermoſt* of the greateſt, and underneath ſet down the Difference, giving it the ſame *Name* or *Denomination.*

Firſt Example.

If from $\frac{4}{7}$
you take $\frac{2}{7}$
there will remain . $\frac{2}{7}$

or

If from . . 4
you take . . 2
there remains 2, that *is* to ſay, $\frac{2}{7}$.

Second Example.

To take $\frac{2}{3}$ from $\frac{3}{4}$, you muſt turn the $\frac{3}{4}$ into $\frac{9}{12}$, and the $\frac{2}{3}$ into $\frac{8}{12}$; and then take 8 from 9, which *leaves* 1, that is to ſay $\frac{1}{12}$.

Third Example.

To take 3 *whole Numbers* from 5 $\frac{3}{4}$; you muſt ſay; take *nothing* from $\frac{3}{4}$, and there *remains* $\frac{3}{4}$ ſtill; and take 3 *whole Numbers* from 5, and there remains 2; ſo all the *Remainder* or *Difference* is 2 and $\frac{3}{4}$.

Fourth Example.

IF from 6 you are to take 3 $\frac{2}{3}$, you muſt borrow 1 of the 6, and make $\frac{3}{3}$ of it; and then ſay; $\frac{2}{3}$ from $\frac{3}{3}$.

and there remains $\frac{1}{3}$, which I ſet down, and carry away the 1 that I borrow'd of the 6; then the 1 *whole Number* that I borrow'd and 3 makes 4, which taken from 6, *leaves* 2, and thus all the *Remainder* will be 2 $\frac{1}{3}$.

From the *Sum* . . 6 *Integers,*
take away . . . . . 3 $\frac{2}{3}$
Leaves . . . . . 2 $\frac{1}{3}$

Fifth Example.

15 *common Name.*
If from 4 $\frac{3}{5}$ . . . . . 9, that is, $\frac{9}{15}$
you take 3 $\frac{2}{3}$ . . . . . 10, that is, $\frac{10}{15}$
there will remain 0 $\frac{14}{15}$

NINE *Fifteenths* can't pay 10 *Fifteenths*; therefore I borrow 1 *whole Number* of the 4 on the Side; and this *whole Number* being in Value $\frac{15}{15}$, join'd to $\frac{9}{15}$, makes $\frac{24}{15}$; from which taking 10 *Fifteenths*, there remains $\frac{14}{15}$; then coming to the *whole Numbers*, I ſay; 1 *whole Number* that I carry, and 3, makes 4, which taken from 4 *leaves nothing*, and ſo my *Sum* is finiſhed.

ALL Sorts of *Subtractions* in *Fractions* are to be met with under one or other of theſe *five Examples*; which ſerve in all Caſes.

Multipli-

Multiplication of FRACTIONS.

MULTIPLICATION of *Fractions* is very eaſy; it is but *multiplying* all the *Uppermoſts* together, and placing their *Product* over a Line; under which you muſt ſet down the *Product* of the *Undermoſts*, all *multiplied* together in like Manner.

Firſt Example. To multiply $\frac{2}{3}$ by $\frac{3}{4}$; you muſt work as follows:

And ſay; $\left\{ \frac{2 \text{ times } 3, \text{ is } 6}{3 \text{ times } 4, \text{ is } 12} \right\}$ which $\frac{6}{12}$ may be reduc'd to $\frac{1}{2}$, the *Half* of an *Integer*.

YOU ſee that it is but counting $\frac{3}{4}$, of the *two Thirds once*; or elſe $\frac{2}{3}$ of the $\frac{3}{4}$ *once*, which comes to the ſame Thing: This is alſo call'd, the *Reducing a Fraction of a Fraction* into a *ſimple Fraction*; or otherwiſe, taking one *Fraction* of another *Fraction*, or one *Portion* of another *Portion*; which is always the ſame in the main.

Second Example. To multiply 4 $\frac{2}{3}$ by 2 *whole Numbers*; I ſay; 2 times $\frac{2}{3}$, makes $\frac{4}{3}$, which is 1 and $\frac{1}{3}$; I ſet down the $\frac{1}{3}$, and carry away the *Integer* to the 2 times 4, making 9; which I ſet down in the *Product*, being in all 9 $\frac{1}{3}$.

The *Sum* { 4 $\frac{2}{3}$ *to be multiplied*
by 2 *whole Numbers*,
——
makes 9 $\frac{1}{3}$ the whole *Product*.

Third Example. To multiply 5 by 3 $\frac{4}{5}$; I ſet down 5 under the 3 $\frac{4}{5}$ (for it's no matter whether it be *uppermoſt* or *undermoſt*, ſince 5 multiplied by $3\frac{4}{5}$, or $3\frac{4}{5}$ multiplied by 5, produce always the ſame Number): and working as in the ſecond Example, I ſay; 5 times $\frac{4}{5}$, is $\frac{20}{5}$; which is juſt 4 *whole Numbers*; (for *dividing* 20 by 5, gives 4;) which joined to the 5 times 3 *whole Numbers*, which is 15 *whole Numbers*, it makes the Product in all 19 *whole Numbers*.

Fourth Example. To multiply $3\frac{5}{6}$ by $2\frac{2}{5}$; I turn the $3\frac{5}{6}$ all into *Sixths*, which is $\frac{23}{6}$; I alſo turn the $2\frac{2}{5}$ all into *Fifths*, which makes $\frac{12}{5}$:

$$\text{Afterwards} \left\{ \frac{12}{5} \begin{matrix}\text{times}\\ \text{times}\end{matrix} \frac{23,}{6,} \begin{matrix}\text{is}\\ \text{is}\end{matrix} \frac{276}{30} \right\} \text{ or } 9\tfrac{1}{5}.$$

For 276 *divided* by 30, gives the *Quotient* $9\frac{6}{30}$, which *reduced* is $9\frac{1}{5}$ for the *Anſwer*.

So $3\frac{5}{6}$ multiplied by $2\frac{2}{5}$, or $2\frac{2}{5}$ by $3\frac{5}{6}$ produces 9 *whole Numbers* and $\frac{1}{5}$ of a *whole Number*.

ALL Sorts of *Multiplications*, where there are any *Fractions*, are wrought according to ſome one of theſe four *Examples*, which ſerve in all Caſes.

Diviſion of FRACTIONS.

FRACTIONS muſt always have the ſame *Name* before they can be *divided* by one another; and then taking no notice of their *Undermoſt*, you muſt *divide* one *Uppermoſt* by the other, as in *Diviſion* of *whole Numbers*.

Firſt Example. To *divide* $\frac{10}{12}$ by $\frac{3}{12}$, you need but *divide* the *uppermoſt* 10, by the *uppermoſt* 3, which will give 3, and 1 remains to be ſet over a

Line at the end of the *Quotient*, with the *Diviſor* 3 underneath it; that each of the three Portions may be $3\frac{1}{3}$.

3) 10 ($3\frac{1}{3}$ *Quotient*,
9
1

which multiplied by the *Diviſor* 3, produces 10, as in the *Dividend*, for a *Proof*.

Second Example To *divide* $\frac{3}{4}$ by $\frac{2}{5}$: You muſt bring theſe two *Fractions* into the ſame *Denomination*; ſo inſtead of $\frac{3}{4}$, you will have $\frac{15}{20}$, and for $\frac{2}{5}$, you will find $\frac{8}{20}$

Then *dividing one Uppermoſt* by the *other*, you have $1\frac{7}{8}$ the *Anſwer*.

8) 15 ($1\frac{7}{8}$ *Quotient*.
8
7

THE *common Name* 20 is now quite omitted; it being of no further Service, after you are ſure that both the *Fractions* are of the ſame *Denomination*.

BUT if, on the contrary, you would *divide* 8 by 15, you cannot; wherefore you muſt place 8 over a Line, and 15 underneath, in this Manner $\frac{8}{15}$. Thus 15 Perſons, who ſhould have 8 Things to be equally parted amongſt them, would find there belonged to each one, 8 times the *fifteenth Part* of 1 of thoſe Things; or elſe 1 *Bit* of each Thing cut into 15 equal Pieces. And this is the Riſe of *Arithmetical Fractions*, when the *Dividend*, or Number to be *divided*, is leſs than the *Diviſor*.

Third Example. To *divide* 8 by $\frac{3}{4}$: I multiply the 8 by the 4 of the $\frac{3}{4}$, to turn it into $\frac{32}{4}$; then I *di-*

I *divide* the *Uppermoſt* . . . . . . 32 } 10 $\frac{2}{3}$
by the *Uppermoſt* of the $\frac{3}{4}$, which is 3 } *Quotient*; which denotes, that 8 contains 10 times and $\frac{2}{3}$ of a Time, the $\frac{3}{4}$ by which it was *divided*.

Fourth Example. To *divide* 6 by 2 $\frac{2}{3}$: Reduce 2 $\frac{2}{3}$ all into *Thirds*, which is $\frac{8}{3}$; *turn* alſo the 6 into *Thirds*, which is $\frac{18}{3}$.

Then *divide* the *uppermoſt* 18 } gives 2 and $\frac{2}{8}$,
by the *uppermoſt* . . . 8 } or $\frac{1}{4}$ for each *Share*; that is to ſay, that $\frac{8}{3}$ ſhall have each $\frac{2}{3}$, and $\frac{1}{4}$ of $\frac{1}{3}$. To *prove* it; multiply 2 $\frac{1}{4}$ by 8, and you will have 18 in the *Product*.

Fifth Example. To *divide* 9 $\frac{3}{4}$ by 3; I multiply the 9 by the 4, in the *Fraction* on the Side, which gives 36; added to 3 the *uppermoſt* of the Fraction, makes 39 *Quarters*; I multiply alſo the *Diviſor* 3 by the ſame 4, which gives 12 *Quarters*.

And *dividing* . . . . 39 } gives 3 $\frac{1}{4}$ for each *Share*.
by . . . . . 12 }
For *Proof*; 12 times 3 $\frac{1}{4}$ is 39.

WE might at once have taken the *third Part* of 9, which is 3; and the *third Part* of $\frac{3}{4}$, which is $\frac{1}{4}$, without working the *Diviſion* in Form; but we did this on purpoſe, that you might not be at a Loſs when the *Numbers* and *Fractions* of the *Diviſor* may be larger.

Sixth Example. To *divide* 8 $\frac{2}{3}$ by 4 $\frac{3}{5}$: *Firſt*, I turn the 8 $\frac{2}{3}$ all into *Thirds*, which gives $\frac{26}{3}$; then I turn the 4 $\frac{3}{5}$ all into *Fifths*, which makes $\frac{23}{5}$; and the *Sum* being thus reduc'd, you are to *divide* $\frac{26}{3}$ by $\frac{23}{5}$;

then multiplying croſſwiſe, 26 the *uppermoſt* of the firſt Fraction by 5 the *undermoſt* of the ſecond, and you will have 130 to be *divided:* In like Manner multiplying the *uppermoſt* of the ſecond by the *undermoſt* of the firſt, you have 69 for a *Diviſor*; being ſure that the *common Name* is *Fifteenths*, becauſe the two *Undermoſts* multiplied together make 15.

Then *dividing* 130 by 69, you have the *Quotient* 1 $\frac{61}{69}$, which cannot be *reduced*, or brought into any *leſs Terms*.

YOU may eaſily perform all manner of *Diviſions*, where there are any Fractions, according to theſe ſix different Examples; which I have choſen ſhould be ſmall ones, on purpoſe that I might not perplex the Mind of the Learner, ſince little familiar Examples are ſufficient, and more proper to enlighten the Underſtanding than larger *Sums*; which are alſo founded upon the ſame Principles as thoſe that are leſs.

A LIST,

A LIST, *with the* Value *of certain* Weights *and* Meaſures *in* ENGLAND.

Weights for *Gold*, *Silver*, *Bread*, *Liquors*, &c. commonly called *Troy Weight*.

One Pound.

weighs	12 Ounces,	1 Ounce *is*	$\frac{1}{12}$	}	of a *Pound.*
or	240 Pen.w$^{ts.}$	1 Pen. wt. *is*	$\frac{1}{240}$		
or	5760 Grains.	1 Grain *is*	$\frac{1}{5760}$		

One Ounce

weighs	20 Pen. w$^{ts.}$	1 Pen. w^{t}. *is*	$\frac{1}{20}$	}	of an *Ounce.*
or	480 Grains.	1 Grain *is*	$\frac{1}{480}$		

One Penny weight

weighs	24 Grains.	1 Grain *is*	$\frac{1}{24}$	}	of an *Ounce.*

Apothecaries

Apothecaries Weights.

An Apothecary's Pound

weighs	12	Ounces,	1 Ounce *is*	$\frac{1}{12}$	of a *Pound.*
or	96	Drams,	1 Dram *is*	$\frac{1}{96}$	
or	288	Scruples,	1 Scruple *is*	$\frac{1}{288}$	
or	5760	Grains.	1 Grain *is*	$\frac{1}{5760}$	

One Ounce

weighs	8	Drams,	1 Dram *is*	$\frac{1}{8}$	of an *Ounce.*
or	24	Scruples,	1 Scruple *is*	$\frac{1}{24}$	
or	480	Grains.	1 Grain *is*	$\frac{1}{480}$	

One Dram

weighs	3	Scruples,	1 Scruple *is*	$\frac{1}{3}$	of a *Dram.*
or	60	Grains.	1 Grain *is*	$\frac{1}{60}$	

One Scruple

weighs	20	Grains,	1 Grain *is*	$\frac{1}{20}$	of a *Scruple.*

N. *B*. The *Apothecaries* uſe the following *Characters* for theſe *Weights*, viz.

For a *Pound* they write ℔, for an *Ounce* ℥, for a *Dram* ʒ, for a *Scruple* ℈, for a *Grain* gr.

By theſe *Weights* the *Apothecaries* compound their *Medicines*; but they buy and ſell their *Drugs* by *Avoirdupois Weight*.

Avoirdupois

Avoirdupois Weight.

One Hundred Weight

weighs	112 Pounds,	1 Pound *is*	$\frac{1}{112}$	of a *C.* wt.	
or	1792 Ounces,	1 Ounce *is*	$\frac{1}{1792}$		
or	28672 Drams.	1 Dram *is*	$\frac{1}{28672}$		

One Pound

weighs	16 Ounces,	1 Ounce *is*	$\frac{1}{16}$	of a *Pound.*
or	256 Drams,	1 Dram *is*	$\frac{1}{256}$	

One Ounce

weighs	16 Drams.	1 Dram *is*	$\frac{1}{16}$	of an *Ounce.*

There are alſo uſed the following *Weights.*

A Stone *weighs*	14 ℔,	*and is*	$\frac{1}{8}$	of a *C.* wt.
A Quarter -	28 ℔,	*and is*	$\frac{1}{4}$	
A Half *C.* wt.	56 ℔,	*and is*	$\frac{1}{2}$	
Three Quarters	84 ℔,	*or*	$\frac{3}{4}$	

Alſo one Tun

weighs 2240 Pounds, *or* 20 *C.* Weight.

N. B. By this *Weight* are weighed all *Grocery Wares*; and Copper, Tin, and all *Metals*, except *Gold* and *Silver*; alſo *Fleſh*, *Butter*, *Cheeſe*, *Salt*; likewiſe *Pitch*, *Tar*, *Roſin*, *Flax*, &c.

Long

Long Meaſure.

One Mile

meaſures	8 Furlongs,	1 Furlong	*is*	$\frac{1}{8}$	of a *Mile.*
or	320 Poles,	1 Pole	*is*	$\frac{1}{320}$	
or	1760 Yards,	1 Yard	*is*	$\frac{1}{1760}$	
or	5280 Feet,	1 Foot	*is*	$\frac{1}{5280}$	
or	63360 Inches.	1 Inch	*is*	$\frac{1}{63360}$	

As it is plain to the meaneſt Capacity, that a *Furlong* muſt be $\frac{1}{8}$ of a *Mile*, when the Table ſhews that a *Mile* contains or meaſures 8 *Furlongs*; therefore I ſhall henceforward only ſet down, *how many* of the *leſſer Meaſures* are contained in any *one* of the *greater*; whence it will appear at firſt Sight what *Fraction* or *Part* any *one* of the *leſſer Meaſures* muſt be of the ſame *greater Meaſure*.

One Furlong		*One* Pole	
meaſures	40 Poles,	*meaſures*	5 $\frac{1}{2}$ Yards,
or	220 Yards,	*or*	16 $\frac{1}{2}$ Feet,
or	660 Feet,	*or*	198 Inches.
or	7920 Inches.		

One Yard		*One* Foot	
meaſures	3 Feet,	*meaſures*	12 Inches.
or	36 Inches.		

N. B. WHEN there are any *Fractions* after the *Numbers in* the *Table*, you muſt reduce the *Number* of *Integers*, and the *Fraction*, into one *Fraction*, by the ſecond Rule for *Reduction* of *Fractions* taught in our Treatiſe of *Fractions* (Page 76.) Thus one *Pole* contains or meaſures $5\frac{1}{2}$ *Yards*, or $\frac{11}{2}$ of a *Yard*; and ſo of others. Then to know what *Fraction* of a *Pole*, *a Yard* is; change the *Places* of the *Uppermoſt*, and the *Undermoſt*, which will give $\frac{2}{11}$: for if a *Pole* meaſures $\frac{11}{2}$, or eleven *Halfs* of a *Yard*, a *Yard* muſt be $\frac{2}{11}$ or two *eleventh Parts* of a *Pole*.

Cloth Meaſure.

One Yard		*One* Quarter	
meaſures	4 Quarters,	*meaſures*	4 Nails.
or	16 Nails.		

N. B. One *Ell* is $1\frac{1}{4}$ or $\frac{5}{4}$ of a *Yard*, or 45 *Inches*. Alſo 2 *Yards* make a *Fathom*.

Liquid Meaſure.

One Gallon *contains* 4 Quarts, or 8 Pints.

But the greater Meaſures *are* different, *according as they are applied to* different Liquids.

Wine Meaſure.

One Tun
contains 4 Hogſheads,
or 252 Gallons.
One Hogſhead,
contains 63 Gallons.

Alſo		
18 Gall.	make one	Rundlet,
$31\frac{1}{2}$ Gall.	make one	Barrel,
42 Gall.	make one	Tierce,
84 Gall.	make one	Punchion,
2 Hhds. *or* 126 Gal.	make one	Butt *or* Pipe.

Ale

Ale Meaſure.

One Hogſhead		*And one*	
contains	1½ Barrels,	Barrel *contains*	32 Gall.
or	3 Kilderkins,	Kilderkin	16 Gall.
or	6 Firkins,	Firkin	8 Gall.
or	48 Gallons.		

N. B A *Firkin of Soap*, and of *Herrings*, are the ſame with a *Firkin* of Ale.

Beer Meaſure.

One Hogſhead		*And one*	
contains	1½ Barrels,	Barrel *contains*	36 Gall.
or	3 Kilderkins,	Kilderkin	18 Gall.
or	6 Firkins,	Firkin	9 Gall.
or	54 Gallons.		

N. B. This *Diſtinction* or *Difference* betwixt *Ale* and *Beer Meaſure*, is now only uſed in *London:* But by a *Statute* of *Exciſe* made *A. D.* 1689. all other *Places* of *England* were commanded to obſerve the following

Meaſure for *Beer* and *Ale.*

One Hogſhead		*And one*	
contains	1½ Barrels,	Barrel *contains*	34 Gall.
or	3 Kilderkins,	Kilderkin	17 Gall.
or	6 Firkins,	Firkin	8½ Gall.
or	51 Gallons.		

Dry Meaſure.

One Quarter		*One* Load	
contains	8 Buſhels,	*contains*	5 Buſhels,
or	32 Pecks;	*or*	20 Pecks,
or	64 Gallons.	*or*	40 Gallons.

One Buſhel		*One* Gallon	
contains	4 Pecks,	*contains*	4 Quarts,
or	8 Gallons.	*or*	8 Pints.

Obſerve alſo in Dry Meaſure,

A Laſt		*A* Chaldron	
contains	2 Weys,	*contains*	4 Quarters,
or	10 Quarters.	*or*	32 Buſhels.

Time.

A Year		*A* Day	
contains	365 ¼ Days,	*contains*	24 Hours,
or	8766 Hours,	*or*	1440 Minutes,
or	525960 Minutes.	*or*	86400 Seconds.

As an *Hour* is divided into 60 *Minutes*, and a *Minute* into 60 *Seconds*; ſo the *Mathematicians* in nice Calculations ſubdivide one *Second* into 60 *Thirds*, and one *Third* into 60 *Fourths*, &c. as far as they pleaſe; marking them thus:

Days ° ′ ″ ‴ ⁗
15 : 19 : 17 : 43 : 34 . 18, &c.

which they read; 15 *Days*, 19 *Hours*, 17 *Minutes*, 43 *Seconds*, 34 *Thirds*, 18 *Fourths*, &c.

IN the *Royal Navy*, they pay the Men their Wages by the following *Table*:

	One Year		*One* Month
contains	13 Months,	*contains*	4 Weeks,
or	52 Weeks,	*or*	28 Days.
or	364 Days.		

FOR *Sums* where no great Exactneſs is required, they uſe this *Table*;

	One Year		*One* Month
contains	12 Months,	*contains*	30 Days.
or	360 Days.		

BUT if you would be exact, you muſt reckon 365 ¼ Days to a Year, as in the *firſt Table*.

Square Meaſure.

FORTY *Poles* (or *Perches*) in Length, and four in Breadth, make a *Statute Acre* of *Land*; therefore

	One Acre		*One* Pole
contains	160 Poles,	*contains*	30 ¼ Yards,
or	4840 Yards,	*or*	272 ¼ Feet.
or	43560 Feet.		

For *leſſer Meaſures.*

One Square Yard		*One* Square Foot	
contains	9 Feet,	*contains*	144 Inches.
or	1296 Inches.		

Solid or *Cubical Meaſure.*

A ſolid Foot *contains* 1728 ſolid *Inches.*

AND as the Method of *Gauging* begins firſt with finding the Number of *ſolid Inches*, and afterwards reduces the *ſolid Inches* into *Gallons*, &c. it will not be improper to add, that

231 ſolid Inches *make a* Wine Gallon.
282 ſolid Inches - - - *an* Ale *or* Beer Gallon.
268$\frac{4}{5}$ ſolid Inches - - - *a* Corn Gallon.

Reduction of MONEY.

ONE *Pound* is in Value 20 *Shillings*; and 20 *Shillings* make 1 *Pound.*

One *Shilling* is in Value 12 *Pence*; and 12 *Pence* make 1 *Shilling.*

If 1 *Pound* be worth 20 *Shillings*, then 1 *Shilling* is $\frac{1}{20}$ of a *Pound.*

If 1 *Shilling* be worth 12 *Pence*, then 1 *Penny* is $\frac{1}{12}$ of a *Shilling.*

And if 1 *Pound* be 240 *Pence*, 1 *Penny* muſt be $\frac{1}{240}$ of a *Pound.*

The Uſe of the foregoing Tables.

To bring *Pounds* into *Shillings*; you *multiply* the *Pounds* by 20 *Shillings*, the Value of one *Pound*, which gives the Value of them all in *Shillings.*

Example.
2 *Pounds*
at 20 *Shil.* each,
make 40 *Shil.*

On the contrary, To turn *Shil.* into *Pounds*; you *divide* the *Shillings* by 20, the *Shillings* in one *Pound*; which ſhews the Number of *Pounds* contain'd in all thoſe *Shillings.*

Example.
I divide 40 *Shil.*
by 20 gives 2 *l.*

To bring *Shillings* into *Pence*; *multiply* the *Shillings* by 12, the Number of *Pence* in one *Shilling*, and the Product is the *Pence* contain'd in all thoſe *Shillings*.

Example.
3 *Shillings*
of 12 *Pence* each,
come to 36 *Pence.*

But on the contrary, to turn *Pence* into *Shillings*; you divide by 12, the *Pence* in one *Shilling*; and that gives the *Shillings* contain'd in the *Whole Sum*.

Example.
I divide 36 *Pence*
by . . 12 { ſhews 3 *Shil.*

In order to bring *Pounds* into *Pence* at once, you muſt *multiply* the *Pounds* by 240, the *Pence* in a *Pound*; and if at once you would turn *Pence* into *Pounds*, you muſt *divide* the *Pence* by 240, the Number of *Pente* contain'd in one *Pound*, and what is given in the *Quotient* are *Pounds*. But if there be any *Remainder*, they are *Pence*, which may be turn'd into *Shillings* in *dividing* them by 12, &c.

If theſe four *Examples* be well underſtood, they are ſufficient to teach you all Sorts of *Reductions* of *Money*, *Weights*, and *Meaſures*, &c. Obſerve, 'tis a *General Rule*, that whenever you *reduce* any *Number* of Greater Things into Leſs; you muſt always *multiply* the *Number* of *Greater* Things by that *Number* which *one* of them contains of the *Leſs*, and the *Product* is the *Number* of *Leſſer* Things contained in he *Whole Sum* of the *Greater*.

But on the contrary, when you deſire to bring a *Number* of *Smaller* Things into any that are *Larger*; you muſt always *divide* the *Number* of *Smaller* Things by *How many* of them are contained in *one* of the *Larger*,

Larger, which ſhews in the *Quotient* of the *Diviſion*, what *Number* of theſe *Larger* Things are of equal Value to all the *Leſſer* ones; as you may obſerve in the four foregoing *Examples*.

Advertiſement. In any *Examples* hereafter, where it is neceſſary to *reduce Pounds* into *Shillings* and *Pence*; we ſhall double the *Number* of *Pounds*, and then put a *Cypher* after them, or elſe in the Place of the 0, we ſhall ſet down the *Number* of *Shillings*, that may be following the *Pounds*; and after this Manner ſhall we *multiply Pounds* by 20, to bring them into *Shillings*.

ON the contrary, when we turn *Shillings* into *Pounds*; we ſhall cut off the firſt *Figure* on the Right-hand, and take the *Half* of all the *Figures* on the Left, which turns them into *Pounds*; and if 1 remains after the *Half* is taken, it ſignifies 1 *Ten Shillings*, and is to be joined to the *Figure* that is cut off, which denotes ſo many *Shillings*; and in this Way we *divide* the *Shillings* by 20, to turn them into *Pounds*.

THE *Shillings* that are to be brought into *Pence*, we *multiply* by 12 at once, as if it was a ſingle *Figure*, that ſo we may uſe the feweſt *Figures*, and take up but one *Line*: And for the ſame Reaſon we take the *Twelfth* Part of the *Pence* at once, to turn them into *Shillings*; and if there be any *Pence remaining*, we ſet them down by the *Shillings* given in the *Quotient*, which is the Way we divide by 12, to turn *Pence* into *Shillings*: But in order to work this readily, it is abſolutely neceſſary you ſhould know how to multiply any of the nine Figures by 12 at once.

3 times 3 is 9. Therefore the third Part of the Product 9 is 3.

3 times 4, or 4 times 3, is 12. Then 3 is the $\frac{1}{4}$, and 4 is the $\frac{1}{3}$ of the Product 12.

3 times 5, or 5 times 3, is 15. Then 3 is the $\frac{1}{5}$, and 5 is the $\frac{1}{3}$ of the Product 15.

3 times 6, or 6 times 3, is 18. Then 3 is the $\frac{1}{6}$, and 6 is the $\frac{1}{3}$ of the Product 18.

3 times 7, or 7 times 3, is 21. Then 3 is the $\frac{1}{7}$, and 7 is the $\frac{1}{3}$ of the Product 21.

3 times 8, or 8 times 3, is 24. Then 3 is the $\frac{1}{8}$, and 8 is the $\frac{1}{3}$ of the Product 24.

3 times 9, or 9 times 3, is 27. Then 3 is the $\frac{1}{9}$, and 9 is the $\frac{1}{3}$ of the Product 27.

4 times 4 is 16. ***Sixteen*** is the *Square* of 4, and ***Four*** is the *Square Root* of 16.

4 times 5, or 5 times 4, is 20. Then the $\frac{1}{4}$ of 20 is 5, and the $\frac{1}{5}$ is 4.

4 times 6, or 6 times 4, is 24. Then the $\frac{1}{4}$ of 24 is 6, and the $\frac{1}{6}$ is 4.

4 times 7, or 7 times 4, is 28. Then the $\frac{1}{4}$ of 28 is 7, and the $\frac{1}{7}$ is 4.

4 times 8, or 8 times 4, is 32. Then the $\frac{1}{4}$ of 32 is 8, and the $\frac{1}{8}$ is 4.

4 times 9, or 9 times 4, is 36. Then the $\frac{1}{4}$ of 36 is 9, and the $\frac{1}{9}$ is 4.

5 times 5 is 25. ***Five*** is the *Square Root* of 25, and *Twenty-five* is the *Square* of 5.

5 times 6, or 6 times 5, is 30. Then the $\frac{1}{5}$ of 30 is 6, and the $\frac{1}{6}$ is 5.

5 times 7, or 7 times 5, is 35. Then the $\frac{1}{5}$ of 35 is 7, and the $\frac{1}{7}$ is 5.

5 times 8, or 8 times 5, is 40. Then the $\frac{1}{5}$ of 40 is 8, and the $\frac{1}{8}$ is 5.

5 times 9, or 9 times 5, is 45. Then the $\frac{1}{5}$ of 45 is 9, and the $\frac{1}{9}$ is 5.

6 times 6 is 36, the *Square* of the Root *Six*.

6 times 7, or 7 times 6, is 42. Then the *6th* of 42 is 7, and the *7th* is 6.

6 times 8, or 8 times 6, is 48. Then the *6th* of 48 is 8, and the *8th* is 6.

6 times 9, or 9 times 6, is 54. Then the *6th* of 54 is 9, and the *9th* is 6.

7 times 7 is 49, the *Square* of the Root *Seven*.

7 times 8, or 8 times 7, is 56. Then the *7th* of 56 is 8, and the *8th* is 7.

7 times 9, or 9 times 7, is 63. Then the *7th* of 63 is 9, and the *9th* is 7.

8 times 8 is 64, the *Square* of the Root *Eight*.

8 times 9, or 9 times 8, is 72. Then the *8th* of 72 is 9, and the *9th* is 8.

9 times 9 is 81, the *Square* of the Root *Nine*.

IN this Way, or ſomewhat like it, you ſhould reaſon with all *Numbers*, that are *multiplied* together, or into one another; in order to learn to *multiply* and *divide*, both at the ſame Time. For to take the *5th* Part of a *Sum*, or *Number*, is the ſame as to *divide* it by 5, or to *part* it into 5 equal Parts; and to take the *6th*, the *12th*, or the *20th* Part of any *Sum*, is all one as if you *divide* that *Sum* by 6, by 12, or by 20, *&c.* The ſame is to be ſaid with reſpect to any other *Numbers* you have to *divide* by.

At firſt we had no Deſign to ſhew the Manner of drawing up an Account of any Number of *Ells*; which is indeed intirely needleſs to thoſe that have a good Notion of the foregoing *Treatiſe of Fractions*. But that we might ſatisfy every body, if poſſible, we ſhall give you one as follows.

A Method whereby the Fractions of an Ell, or of any Thing elſe, may be added up.

$\frac{1}{2}$, one *Half* of a *Pound*, being 10 *Shillings*, we therefore ſet down 10 *Shillings* after the $\frac{1}{2}$, or one *Half* of an *Ell*, which is an *Integer*, as well as a *Pound* of 20 *Shillings*; and ſo for any other *Fractions* of an *Ell*.

Wherefore we conſider

$\frac{1}{2}$ of an *Ell*, as $\frac{1}{2}$ of a *Pound*, which is worth 10 *s.*

$\frac{1}{4}$ of an *Ell*, as $\frac{1}{4}$ of a *Pound*, which is worth 5 *s.*

$\frac{3}{4}$ of an *Ell*, as $\frac{3}{4}$ of a *Pound*, which are in Value 15 *s.*

$\frac{1}{3}$ of an *Ell*, as $\frac{1}{3}$ of a *Pound*, which is worth 6 *s.* 8 *d.*

$\frac{2}{3}$ of an *Ell*, as $\frac{2}{3}$ of a *Pound*, which are in Value 13 *s.* 4 *d.*

$\frac{1}{6}$ of an *Ell*, as $\frac{1}{6}$ of a *Pound*, which is worth 3 *s.* 4 *d.*

$\frac{1}{8}$ of an *Ell*, as $\frac{1}{8}$ of a *Pound*, which is 2 *s.* 6 *d.*

$\frac{1}{12}$ of an *Ell*, as $\frac{1}{12}$ of a *Pound*, which is 1 *s.* 8 *d.*

$\frac{7}{12}$ of an *Ell*, as $\frac{7}{12}$ of a *Pound*, which are 11 *s.* 8 *d.*

$\frac{1}{24}$ of an *Ell*, as $\frac{1}{24}$ of a *Pound*, which is 0 *s.* 10 *d.*

$\frac{5}{24}$ of an *Ell*, as $\frac{5}{24}$ of a *Pound*, which are 4 *s.* 2 *d.*

$\frac{1}{16}$ of an *Ell*, as $\frac{1}{16}$ of a *Pound*, which is 1 *s.* 3 *d.*

$\frac{9}{16}$ of an *Ell*, as $\frac{9}{16}$ of a *Pound*, which make 11 *s.* 3 *d.*

$\frac{1}{48}$ of an *Ell*, as $\frac{1}{48}$ of a *Pound*, which is 0 *s.* 5 *d.*

$\frac{7}{48}$ of an *Ell*, as $\frac{7}{48}$ of a *Pound*, which make 2 *s.* 11 *d.*

LET us now *add* together

by this Method, -	$\frac{1}{2}$ *of an* Ell, *or* 10 Shillings
with - - - -	$\frac{3}{4}$ *of an* Ell, *or* 15 Shillings
and with - - -	$\frac{1}{8}$ *of an* Ell, *or* 2 Sh. 6 Pen.
The Total will be - -	1 Ell & $\frac{3}{8}$ *or* 1 £. 7 *s.* 6 *d.*

THUS you ſee that as 10 *Shillings*, 16 *Shillings*, and 2 *Shillings* 6 *Pence*, added together, make 1 £. 7 *s.* 6 *d.* which is juſt 1 *Pound* and three *Eighths* of a *Pound*; ſo $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{1}{8}$ of an *Ell*, added together, make 1 *Ell* and three *Eighths* of an *Ell*. This little Example might ſuffice without giving any other :

But otherwiſe let us conſider

$\frac{1}{2}$ *of an* Ell, *as* $\frac{1}{2}$ *of* 48 Shil. *which is* 24 Shil.

$\frac{1}{3}$ *of an* Ell, *as* $\frac{1}{3}$ *of* 48 Shil. *which is* 16 Shil.

$\frac{1}{6}$ *of an* Ell, *as* $\frac{1}{6}$ *of* 48 Shil. *which is* 8 Shil.

1 Ell, *or elſe* 48 Shil. *Total* 4 hil.

IN this Manner you may proceed as long as you have occaſion. And if the *Fractions* to be *added* do not exceed 12, you may count

$\frac{1}{2}$ *of an* Ell, *as* $\frac{1}{2}$ *of a* Shil. *which is* 6 Pence.
$\frac{1}{3}$ *of an* Ell, *as* $\frac{1}{3}$ *of a* Shil. *which is* 4 Pence.
$\frac{3}{4}$ *of an* Ell, *as* $\frac{3}{4}$ *of a* Shil. *which is* 9 Pence.
$\frac{5}{12}$ *of an* Ell, *as* $\frac{5}{12}$ *of a* Shil. *which is* 5 Pence.
Total 2 Ells, *or* 2 Shil. *Total* 2 Sh. *or* 2 Integ.

AND if the *Fractions* you have to *add* up do not exceed 24*ths*, you may conſider

$\frac{1}{2}$ *of an* Ell, *as* $\frac{1}{2}$ *of* 24 Shil. *which is* 12 Shil.
$\frac{1}{3}$ *of an* Ell, *as* $\frac{1}{3}$ *of* 24 Shil. *which is* 8 Shil.
$\frac{1}{6}$ *of an* Ell, *as* $\frac{1}{6}$ *of* 24 Shil. *which is* 4 Shil.
1 *Whole* Ell, *or* 24 Shillings. 24 Shil.

THERE are many other *Numbers*, that are proper to be made uſe of for the *Addition* and *Subtraction* of *Fractions*, after the ſame Manner as here above: And all your Buſineſs is, to find the ſame *Undermoſt* to all the *Fractions* after the uſual Method.

Multiplication *of* Pounds, Shillings, *and* Pence, *by two very eaſy* Methods, *but very long ones.*

BY the *firſt Method*, you *multiply* the *Pence* by themſelves, the *Shillings* by themſelves, and the *Pounds* by themſelves.

Example.

To how much come 36 Pieces *of Cloth, at* 25 *l.* 13 *s.* 9 *d. each* Piece?

36 *Pieces*
at 9 *Pence* each
amount to 324 *Pence*, of which
the 12*th* Part is 27 *Shillings*, which are to be ſet down under the *Product* of the *Shillings*.

36 *Pieces*
at 13 *Shillings* each.
1*ſt*. 36 *Pieces* at 3 *s.* come to 108 *Shillings*.
2*dly*. at 10 *s.* they come to 36 . *Shillings*, that is to ſay, 360 *Shillings*.

And the 36 *Pieces* at 13 *Shill.* make 468 *Shillings*.
to which *add* the 27 *Shill.* which the 36 *Pieces* came to at 9 *Pence* each,

which ſhews the *Total* . . . 495 *Shillings*,
of which the 20*th Part* is 24 *l.* 15 *s.* which are to be carried to the *Pounds*.

36 *Pieces*
at 25 *Pounds* each.

1ſt. 36 *Pieces* at 5 £
come to . . . 180 *Pounds.*
2dly at 20 £. they
make . . . 72. or 72 *Tens*, or 720 £.
To which you muſt
join . . . . . 24 £. 15 *s.*
Which gives in the
Total of the 3 Prod. 924 £ 15 *s.*

The *Value* of the 36 *Pieces* at 13 *s.* 9 *d.* each, which is the *Value* of all the 36 *Pieces*, at 25 £. 13 *s.* 9 *d.* each *Piece.*

Thus you ſee you muſt begin in *multiplying* the *leaſt* Things firſt, or by the *leaſt*, and afterwards by thoſe that are *next leaſt*, as here above; where at firſt we *multiply* by the *Pence*, afterwards by the *Shillings*, and then by the *Pounds*. Of the 324 *Pence*, which ariſe by the firſt *Multiplication*, we take the *Twelfth* at once, which gives 27 *Shillings*; and of the 495 *Shillings* in the ſecond, we take the *Twentieth*, in cutting off only the firſt Figure on the Right-hand, which is a 5, and taking the *Half* of the 49, before the Separation on the Left, which is 24, and 1 *Ten* over, which with the 5 that was cut off, makes 15 *Shillings.*

By the *ſecond Method*, we reduce the *Pounds*, *Shillings*, and *Pence*, all into *Pence*, and then *multiply* them by the *Goods*, and the *Product* is *Pence*, of which take the *Twelfth Part*, or *divide* them by 12, to turn them into *Shillings*; which are afterwards turned into *Pounds*, by taking the *Twentieth Part* of them, or *dividing* them by 20.

LET us begin, and *reduce* the Sum 25 £. 13 *s.* 9 *d.* all into *Pence*; and firſt let us *multiply* the
. . . . 25 *Pounds*,
by . . . . . . 20 *Shillings*, the Value of 1 £.

gives . 500 *Shillings*,
to which we *add* the 13 *Shillings* following the 25 £.

makes 513 *Shillings*,
wch we multiply by 12 *Pence* all at once,

to find 6156,
which with 9 *Pence*,

will make 6165 *Pence*, inſtead of 25 £. 13 *s.* 9 *d.*

6165 *Pen.*
to be *multiplied* by . . . . . . 36 *Pices*

The 6 *Pieces* at 6165 *Pence* amount to 36990 *Pen.*
The 30 *Pieces* at 6165 *Pence* amount to 18495. *Pen.*

that is to ſay, 184950 *Pence*.
So the 36 *Pieces* together make juſt 221940 *Pen.*
of which take the 12*th* Part at once,
gives . . . . 18495 *Shil.*

the 20*th* Part of which, is juſt 924 £. 15 *Sh.*

as in the other *Method*.

THE *Examples* we here give you of each of theſe two *Methods*, are not ſo much to teach them, becauſe they are too long; but to ſhew you how to perform all Sorts of *Reductions*, eſpecially thoſe of *Pounds*,

Pounds, *Shillings*, and *Pence*, which are all to be met with in this laſt *Example*; which for this Reaſon ought to be well examin'd, that you may not be at a Loſs in the following Part of the Book, if you ſhould not meet with any of the *Operations* ſet down, in the *Reductions* of *Pounds*, *Shillings*, and *Pence*: Therefore before you proceed any farther, if you would reap any Benefit from this Part, you ſhould learn how to work it readily and well; which Advice we the more willingly give, becauſe it is ſo eaſily follow'd.

Multiplication *of* Pounds, Shillings, *and* Pence, *by one ſingle* Figure.

Example. What is the Value of 4 *Pieces of any Thing whatever, at* 12 *l.* 18 *s.* 9 *d. the Piece?*

SUM.

4 Pieces,
at 12 Pounds, 18 Shillings, 9 Pence *each*,
comes to 51 Pounds, 15 Shillings.

To do this *Sum*, you muſt firſt *multiply* the *Pence* by the 4 *Pieces*; ſaying, 4 *Pieces* at 9 *Pence*, come to 36 *Pence*, which make exactly 3 *Shillings*, to be added to the *Shillings*; ſaying, 4 *Pieces* at 8 *Shillings*, comes to 32 *Shillings*, and 3 *Shillings* that I carry, makes 35 *Shillings*; I ſet down the 5 *Shillings*, and carry away the 3 *Tens*: Afterwards, 4 *Pieces at* 10 *s.* are 4 Tens of *Shillings*, and 3 that I carry, make 7 *Tens* of *Shillings*, or 70 *Shillings*, which are in Value 3 *l.* 10 *s.* I ſet this 10 *Shillings* on the Side of the 5 *Shillings*, to make that 15 *Shillings*, and I carry away the 3 *Pounds*.

AFTER that, coming to the *Pounds*, I ſay; 4 *Pieces* at 2 £. is 8 *Pounds*, and 3 £. which I carried, make 11 *Pounds*; I ſet down 1 *Pound*, and carry the *Ten* to the 4 Times 1 *Ten*, which makes the *Product* 51 *l.* 15 *s.* the Value of the 4 *Pieces* at the Price above mentioned.

THE $\frac{1}{4}$ of the *Product* 51 *l.* 15 *s.* appears to be 12 *l.* 18 *s.* 9 *d*; which is the *Proof*, and may be done without ſetting down a Figure, becauſe they are all there already, except you have done wrong. Thus taking the $\frac{1}{4}$ of 5 *Tens* of *Pounds*, gives 1 *Ten*, as is plac'd above; and there *remains* 1 *Ten Pounds*, which with the 1 *Pound* following makes 11 *Pounds*; the $\frac{1}{4}$ of which, is 2 £. ſet at top; and 3 *Pounds remain*, which with the 15 *Shillings*, make 75 *Shillings*; of which the $\frac{1}{4}$ is 18 *Shillings*, and 3 *Shillings* over, which are 36 *Pence*; the $\frac{1}{4}$ of which, is exactly the 9 *Pence* at top; whereby you ſee it proves.

FOR ſince 4 times 12 *Pounds* 18 *Shillings* 9 *Pence*, makes 51 *Pounds* 15 *Shillings*; of neceſſity the *Fourth* Part of this 51 *l.* 15 *s.* muſt be 12 *l.* 18 *s.* 9 *d.* and 'tis juſt as if you ſhould ſay by a contrary *Queſtion*, 4 *Pieces* in all have coſt 51 *l.* 15 *s.* *How much* is the Price of one ſingle *Piece*?

ALL *Multiplications* of *Pounds*, *Shillings*, and *Pence*, as above, where there is but one ſingle *Figure*, are wrought and prov'd by the ſame, ſo as not to require a Figure extraordinary.

Multiplication by the Aliquot Parts *of* 20 Shillings.

Aliquot Parts are certain *Portions* of a *Whole* Thing, which being added together a certain Number of Times, amount to juſt the Value of the

Whole Thing: Wherefore they are called *Aliquot Parts.* For Example, 5 *Shillings* is an *Aliquot Part*, or the $\frac{1}{4}$ of a *Pound* of 20 *Shillings*; and if you add this 5 *Shillings* four times together, they make up juſt 20 *Shillings*, which is one whole *Pound.*

Aliquot Parts are made uſe of to abbreviate the Work, and produce at one Operation, *Pounds*, *Shillings*, and *Pence*, if there ſhould be any.

THUS they always take of the Merchandiſe, or what repreſents it,

The *Half* for	10 *s.*	The *Third* for	6 *s.* 8 *d.*
The *Fourth* for	5 *s.*	The $\frac{1}{6}$ for	3 *s.* 4 *d.*
The *Fifth* for	4 *s.*	The $\frac{1}{8}$ for	2 *s.* 6 *d.*
The *Tenth* for	2 *s.*	The $\frac{1}{12}$ for	1 *s.* 8 *d.*
The *Twentieth* for	1 *s.*		

BUT if the *Number* of *Shillings* you are to *multiply* by, be no *Aliquot Part* of 20 *Shillings*, you muſt work according to the following Directions.

At 3 *Shillings*: Take out for 2 *Shillings*, and the *Half* of what that gives, for 1 *Shilling.*

At 6 *Shillings*: Take out for 4 *Shillings*, and afterwards for 2 *Shillings*, the *Half* of what ſtands for the 4 *Shillings.*

At 7 *Shillings*: Take out firſt for 5 *Shillings*, and afterwards for 2 *Shillings.*

At 8 *Shillings*: Take out twice for 4 *Shillings*, or 2 times the *Fifth.*

At 9 *Shillings*: Take out for 5 *Shillings*, and afterwards for 4 *Shillings.*

At 11 *Shillings*: Take out for 10 *Shillings*, and afterwards for 1 *Shilling.*

At 12 *Shillings*: Take out for 10 *Shillings*, afterwards for 2 *Shillings*.

At 13 *Shillings*: Take out for 10 *Shillings*, after that for 2 *Shillings*, and then for 1 *Shilling*; being *three* times.

At 14 *Shillings*: Take out for 10 *Shillings*, and afterwards for 4 *Shillings*.

At 15 *Shillings*: Take out for 10 *Shillings*, and afterwards for 5 *Shillings*.

At 16 *Shillings*: Take out for 10 *Shillings*, for 4 *Shillings*, and for 2 *Shillings*; being *three* times.

At 17 *Shillings*: Take out for 10 *Shillings*, for 5 *Shillings*, and for 2 *Shillings*; making *three* times.

At 18 *Shillings*: Take out for 10 *Shillings*, and after that *twice* for 4 *Shillings*.

At 19 *Shillings*: Take out for 10 *Shillings*, for 5 *Shillings*, and for 4 *Shillings*; making *three* times.

Examples of Multiplication by the Aliquot Parts *of* 20 *Shillings*.

AT 10 *Shillings*: Take the ½ of 5 *Ells*, or other Things, gives 2 *Pounds*, and 1 *remains*, which 1 is 10 *Shillings*, or 1 *Ell* at 10 *Shillings*, which is ſet after the 2 *Pounds*, to make 2 *Pounds* 10 *Shillings*.

5 *Ells*
at 10 *Shillings* each,

---

come to 2 *Pounds*, 10 *Shillings*; the 5 together.

At 5 *Shillings:* Take the $\frac{1}{4}$ of 5 *Ells*, gives 1 *Pound*, and 1 *remains*, which 1 is 5 *Shillings*, or one *Ell* at 5 *Shillings*, which we ſet after the 1 *Pound*.

5 *Ells*
at 5 *Shillings* a-piece,

---

come to 1 *Pound*, 5 *Shillings*; the 5 together.

At 4 *Shillings:* Take the *Fifth* Part of 7, gives 1 *Pound*, and 2 *remain*, which are $\frac{2}{5}$, or 2 *Ells* at 4 *Shillings* each, which are worth 8 *Shillings*, to be ſet after the 1 *Pound*.

7 *Ells*
at 4 *Shillings* each,

---

come to 1 *Pound*, 8 *Shillings*; the 7 together.

At 2 *Shillings:* Take the *Tenth*, which is done after ſo eaſy a Manner, that you would do well to take good Notice of it, and remember it; which is, to cut off the *firſt* Figure on the Right-hand, and *double* it, which then becomes *Shillings*, and all the other *Figures* on the Left-hand are *Pounds*.

16 *Ells*
at 2 *Shillings*

---

come to 1 *Pound*, 12 *Shillings*.

AT 1 *Shilling:* The *Twentieth* is eaſily taken; only cut off *one* Figure on the Right-hand, as at 2 *Shillings*, and take the *Half* of all the reſt on the Left-hand, which are *Pounds*; but if there *remains* 1, after you have taken the ½, 'tis to be counted 1 *Ten Shillings*.

37 *Ells*
at 1 *Shilling* each,

come to 1 *Pound* 17 *Shillings*.

AT 6 *Shillings* 8 *Pence*: Take the *Third* of 4 *Ells*, which is 1 *Pound*, and 1 *remains*; which ⅓ is 6 *Shillings*, 8 *Pence*, or elſe one of the 4 *Ells*, which is alſo worth 6 *Shillings* 8 *Pence*, and comes to the ſame Thing.

4 *Ells*
at 6 *Shillings* 8 *Pence* apiece

come to 1 *l.* 6 *s.* 8 *d.* the 4.

AT 3 *Shil.* 4 *Pence:* Take the *Sixth* Part of 9, which is 1 *Pound*, and 3 *remain*, which are the ⅙, or 3 *Ells* of 3 *Shil.* 4 *Pence* each, which makes 10 *Shil.* for all the Three.

9 *Ells*
at 3 *Shil.* 4 *Pence*,

come to 1 *Pound* 10 *Shillings*.

AT 2 *Shil.* 6 *Pence*: Take the *Eighth* Part of 59 gives 7 *Pounds*, and 3 *remain*, which are $\frac{3}{8}$, worth 2 *Shil.* 6 *Pence* each, which come to 7 *Shil.* 6 *Pence*, all three together.

59 *Ells*
at 2 *Shil.* 6 *Pence* apiece,

are worth 7 *l.* 7 *s.* 6 *d.* the 59 together.

Aliquot Parts of 12 Pence.

THESE *Aliquot Parts* are made uſe of, to ſhew at once the *Shillings* and *Pence*, if there ſhould be any.

THUS we take of the *Goods*, or whatever is ſet down to repreſent them,

The *Half*, for 6 *Pence*.
The *Third*, for 4 *Pence*.
The *Fourth*, for 3 *Pence*.
The *Sixth*, for 2 *Pence*.
The *Twelfth*, for 1 *Penny*.

Or elſe the $\frac{1}{4}$ of the $\frac{1}{3}$, or the $\frac{1}{3}$ of the $\frac{1}{4}$.

At 5 *Pence*: Take out for 3 *d.* and afterwards for 2 *d.*

At 7 *Pence*: Take out for 4 *d.* and afterwards for 3 *d.*

At 8 *Pence*: Take out for 4 *d.* twice one after another.

At

5

At 9 *Pence:* Take out for 6 *d.* and afterwards for 3 *d.*

At 10 *Pence:* Take out for 6 *d.* and afterwards for 4 *d.*

At 11 *Pence:* Take out for 6 *d.* for 3 *d.* and for 2 *d.* at three times.

Examples of all the Aliquot Parts *of* 12 Pence.

At 6 *Pence:* Take the $\frac{1}{2}$ of the 7 *Yards*, give 3 *Shillings*, and 1 remains, which $\frac{1}{2}$ is 6 *Pence*, or elſe 1 of the *Ells*, which is alſo worth 6 *Pence*.

7 *Yards*
at 6 *d.* apiece,
come to 3 *s.* 6 *d.* the 7.

At 4 *Pence:* Take the $\frac{1}{3}$ of 17, gives 5 *Shillings*, and 2 remain, which are $\frac{2}{3}$, or 2 *Yards* at 4 *Pence* apiece; ſo the $\frac{2}{3}$ or 2 *Yards* are worth 8 *Pence*.

17 *Yards*
at 4 *d.* apiece,
comes to 5 *s.* 8 *d.* the 17.

At 3 *Pence:* Take the $\frac{1}{4}$ of 19, which gives 4 *Shillings*, and 3 remain, which are $\frac{3}{4}$ of a *Shilling*, or 3 *Yards* at 3 *Pence* apiece, which comes to Pence for all three.

19 *Yards*
at 3 *d.* apiece,
come to 4 *s.* 9 *d.* the 19.

At 2 *Pence:* Take the $\frac{1}{6}$ of 75, which is 12 *Shillings*, and 3 remain, which are $\frac{3}{6}$ of a *Shilling*, that make 6 *Pence*, or 3 *Yards* at 2 *d.* apiece, which come alſo to 6 *Pence.*

75 *Yards*
at 2 *d.*

make 12 *s.* 6 *d.*

At 1 *Penny*: Take the $\frac{1}{12}$ of 75, gives 6 *Shillings*, and 3 remaining, which are $\frac{3}{12}$ of a *Shilling*, or 3 *d.* or elſe 3 *Yards* at 1 *Penny* each.

75 *Yards*
at 1 *d.* each,

come to 6 *s.* 3 *d.*

But as for thoſe that can't take out by 12 at once, they may take out firſt the *Third* Part of the 75, as at 4 *d.* a-piece, which comes to 25 *Shillings*, and then the *Fourth* Part of that, which is 6 *Shillings*, 3 *Pence* for the 1 *Penny*: Laſtly, cancel or ſeparate by a Line, the 25 *Shillings*, which are now of no further Service: The Reaſon of this is, that what it comes to at 1 *Penny*, ought to be the *Fourth* Part of what it comes to at 4 *Pence.* Thus

75 *Yards*
at 4 *d.* each,

come to 25 *Shillings.*

The 4*th* Part is 6 *s.* 3 *d.* for 1 *d.*

Examples

Examples conſiſting of ſeveral Aliquot Parts *of* 12 Pence.

Firſt take out for 3 *Pence*, } 23 *Yards*
And afterwards for 2 *Pence.* } at 5 *Pence* apiece ?

23 *Yards* at 3 *Pence*, come to 5 *Shil.* 9 *Pence.*
And at 2 *Pence*, they come to 3 *Shil.* 10 *Pence.*

Then 23 *Yards* at 5 *d.* come to 9 *Shil.* 7 *d.* the 23.

Take firſt for 4 *Pence*, } 19 *Yards*
And then for 3 *Pence.* } at 7 *Pence* each ?

19 *Yards* at 4 *Pence*, come to 6 *Shil.* 4 *Pence.*
And at 3 *Pence*, they come to 4 *Shil.* 9 *Pence.*

So at 7 *Pence*, they come to 11 *Shil.* 1 *d.* the 19.

Take out for 4 *Pence*, twice. { 19 *Yards*
{ at 8 *Pence* each ?

19 *Yards* at 4 *Pence*, come to 6 *Shil.* 4 *Pence.*
Again at 4 *Pen.* they come to 6 *Shil.* 4 *Pence.*

And at 8 *Pence* they are worth 12 *Shil.* 8 *d.* the 19.

Take firſt for 6 *Pence*, And afterwards for 3 *Pence*.	19 *Yards* at 9 *Pence* each?
19 *Yards* at 6 *Pence*, come to At 3 *Pence* apiece, they come to	9 *Shil.* 6 *Pence.* 4 *Shil.* 9 *Pence.*
And at 9 *Pence*, they are worth	14 *Shil.* 3 *Pence.*

Take firſt for 6 *Pence*, And after that for 4 *Pence*.	19 *Yards* at 10 *Pence* each?
19 *Yards* at 6 *Pence*, come to	9 *Shil.* 6 *Pence.*
At 4 *Pence* apiece, they come to	6 *Shil.* 4 *Pence.*
And at 10 *d.* each, they amount to	15 *Shil.* 10 *Pence.*

Take out for 6 *Pence*, For 3 *Pence*, And for 2 *Pence*.	19 *Yards* at 11 *Pence* each?
19 *Yards* at 6 *Pence*, come to	9 *Shil.* 6 *Pence.*
At 3 *Pence*, they come to	4 *Shil.* 9 *Pence.*
At 2 *Pence*, they come to	3 *Shil.* 2 *Pence.*
And at 11 *Pence* each, they are worth	17 *Shil.* 5 *Pence.*

Aliquot Parts of 24 *Pence*, or 2 *Shillings*.

IN *multiplying* by this excellent Method, you find at once, what Number of *Pounds* there; are and if there be any *Remainder*, after you have found the *Pounds*, you muſt make uſe of the *Aliquot Parts* of 12 *Pence*, to produce the *Shillings* and *Pence*.

THE firſt Thing you have to do, is to cut off the firſt *Figure* of the Merchandize, or Goods to the *Right-hand*; and then take the *Part* out upon all the *Figures* on the *Left-hand* of the *Separation*.

For 6 *Pence:* Take the $\frac{1}{4}$, and of what *remains* join'd to the *Figure* cut off, take the $\frac{1}{2}$.

For 4 *Pence:* Take the $\frac{1}{6}$, and of what *remains* join'd to the *Figure* cut off, take the $\frac{1}{3}$.

For 3 *Pence:* Take the $\frac{1}{8}$, and of what *remains* join'd to the *Figure* cut off, take the $\frac{1}{4}$.

For 2 *Pence:* Take the $\frac{1}{12}$, and of what *remains* join'd to the *Figure* cut off, take the $\frac{1}{6}$.

For 1 *Penny:* Take the $\frac{1}{24}$, and of what *remains* join'd to the *Figure* cut off, take the $\frac{1}{12}$.

Example.

A 6 *Pence:* Take the $\frac{1}{4}$ of 73, is 18 *Pounds*, and there *remains* 1 *Ten* which with the 5 cut off, makes 15, that is to ſay, 15 *Yards* at 6 *Pence* apiece, which come to 7 *s.* 6 *d.*

73. 5 *Yards*
at 6 *d.* apiece?

come to 18 *l.* 7 *s.* 6 *d.*

At 4 *Pence:* Take the $\frac{1}{6}$ of 73, gives 12 *Pounds*, and 1 *remaining*, which with the 5 that is cut off, makes 15, of which the $\frac{1}{3}$ is juſt 5 *Shillings*, according to the Parts of 12 *Pence*.

73. 5 *Yards*
at 4 *d.* apiece?

come to 12 *l.* 5 *s.*

At 3 *Pence:* Take the $\frac{1}{8}$ of 73, gives 9 *Pounds*, and 1 *Ten remains*, which with the 5 cut off, makes 15, which are 15 *Yards*, at 3 *d.* apiece, of which taking the $\frac{1}{4}$, gives 3 *Shillings* 9 *Pence*.

73. 5 *Yards*
at 3 *Pence* each?

come to 9 *l.* 3 *s.* 9 *d.*

At 2 *Pence:* Take the $\frac{1}{12}$ of 73, gives 6 *Pounds*, and there *remains* 1 *Ten*, which with the *Figure* cut off, makes 15, of which the $\frac{1}{6}$ is 2 *Shillings* 6 *Pence*.

73. 5 *Yards*
at 2 *Pence*?

come to 6 *l.* 2 *s.* 6 *d.*

At 1 *Penny:* Take the $\frac{1}{24}$ of 73, gives 3 *Pounds*, and there is 1 *Ten remaining*, which with the 5 that was cut off, makes ſtill 15 *Yards* at 1 *Penny* each, which are worth 1 *Shilling* 3 *Pence*.

73. 5 *Yards*
at 1 *Penny*?

come to 3 *l.* 1 *s.* 3 *d.*

THOSE that can't take out for 1 *Penny* by the 24th at once, may take out firſt for 4 *Pence*; and then ſeparating by a Line what it comes to at 4 *Pence*, take the $\frac{1}{4}$ of it, and this gives the Value at 1 *Penny*.

Parts *of* 24 Pence, *or* 2 Shillings, *that are not* Aliquot.

At 7 *Pence*: Take out for 4 *Pence*, and 3 *Pence*; or elſe for 6 *Pence*, and 1 *Penny*.

At 9 *Pence*: Take out for 6 *Pence*, and 3 *Pence*; or for 8 *Pence*, and 1 *Penny*.

At 10 *Pence*: Take out for 6 *Pence*, and 4 *Pence*, being but twice.

At 11 *Pence*: Take out for 8 *Pence*, and 3 *Pence*, making but twice.

Obſerve, when you have taken the *Third* for 8 *Pence*, you ſhould take twice the $\frac{1}{3}$ of what *remains*, according to the *Aliquot Parts* of 12 *Pence*; but you had better *double* the *Remainder*, and take once the *Third* of that, which produces the ſame Thing with more Eaſe, and ſaves a Line.

Examples of theſe Parts *of* 24 Pence, *that are not* Aliquot.

73· 5 *Yards*
at 7 *Pence* a *Yard* ?

4 *Pence* gives 12 *Pounds* 5 *Shillings*.
3 *Pence* gives 9 *Pounds* 3 *Shillings* 9 *Pence*.

And 7 *Pence* comes to 21 *Pounds* 8 *Shil.* 9 *Pence*.

73· 5 *Yards*
at 9 *Pence* each ?

6 *Pence* gives 18 *Pounds* 7 *Shillings* 6 *Pence*.
3 *Pence* gives 9 *Pounds* 3 *Shillings* 9 *Pence*.

And 9 *Pence* comes to 27 *Pounds* 11 *Shil.* 3 *Pen.*

73· 5 *Yards*
at 10 *Pence* each ?

6 *Pence* gives 18 *Pounds* 7 *Shil.* 6 *Pence*.
4 *Pence* gives 12 *Pounds* 5 *Shil.*

And 10 *Pen.* comes to 30 *Pounds* 12 *Shil.* 6 *Pence*.

73· 5 *Yards*
at 11 *Pence* per *Yard* ?

8 *Pence* gives 24 *Pounds* 10 *Shillings*.
3 *Pence* gives 9 *Pounds* 3 *Shil.* 9 *Pence*.

And 11 *Pen.* comes to 33 *Pounds*, 13 *Shil.* 9 *Pence*.

By the *Examples* foregoing, and their *Explanations*, one may conclude you underſtand the *Aliquot Parts*; and if ſo, you'll eaſily know how to take them out of any Number, or Things, whatever they be, whether *Ells*, *Yards*, *Buſhels*, or *Pounds*, &c.

Methinks alſo it is plain, that all Parts, both *Aliquot* and *Non-Aliquot*, are mere *Fractions*: As for *Example*; to ſet down 12 *Pounds* 15 *Shillings*, 9 *Pence* in *Fractions*; you muſt write them after this manner; 12 *Pounds*, $\frac{15}{20}$, and $\frac{9}{12}$ of a *Twentieth*; or elſe abbreviating theſe *Fractions*, 12 *Pounds*, $\frac{3}{4}$ and $\frac{9}{240}$ of an *Integer*; or elſe ſtill, 12 *Pounds*, $\frac{180}{240}$ of a *Pound*, &c.

The Manner of taking out for 2 *Shillings*, and 1 *Shilling*, as the former Examples in the *Aliquot Parts* of 20 *Shillings*, furniſhes us with a Method, by *which* we may *multiply* by any Number of *Shillings only*, without making uſe of theſe *Aliquot Parts*; which Method may be readily learnt by obſerving the two following Examples.

First Example.

To how much come 24 Hogſheads *of* Wine, *the Price being* 16 *l.* 12 *s.* 6 *d. per* Hogſhead.

24 *Hogſheads* at 6 *l.* come to 144 *l.*

at 10 *l.* they come to 24 . *l.* 24 *Tens*, or 240 *l.*

at 12 *s.* they are worth 14 *l.* .8 *Shillings.*

at 6 *d.* they are worth. . . *l.* 12 *Shillings.*

And at 16 *l.* 12 *s.* 6 *d.* 399 *l.* all together.

Explanation. Having multiplied the 24 *Hogſheads* by 16 *Pounds* after the common Way; I take the *Half* of the 12 *Shillings*, which gives 6 *Pieces* of 2 *Shillings* each, which I keep in Memory, or if I am afraid I ſhould forget, I write them over the 12 *Shillings*; then coming with the 6 *Pieces* of 2 *Shillings* to the 4, belonging to the 24 *Hogſheads*; I ſay, 6 times 4 is 24, that is to ſay, 24 *Pieces* of 2 *Shillings*, (which make 48 ſingle *Shillings*); which are turn'd into *Pounds* at once, by doubling only the laſt Figure, *viz.* the 4 of the 24 *Pieces* of 2 *Shillings*, which makes 8 *Shillings*; and the 2 *Tens* being 2 *Pounds*, I carry them to the 6 times 2, which makes the 14 *Pounds*, I have ſet down: After that, I take for the 6 *Pence*, the *Half* of the 24 *Hogſheads*, which gives 12 *Shillings*, according to the *Aliquot Parts* of 12 *Pence*; for the Number of *Hogſheads* at top is too ſmall to take out of by the *Aliquot Parts* of 2 *Shillings*.

Second Example.

How much will		2769 *Yards* coſt	
at		17 *s.* a *Yard*?	
The 2769 at 16 *s.* come to	2215 *l.*	4 *s.*	
at 1 *Shilling* they are worth	138 *l.*	9 *s.*	
And at 17 *s.* they come to	2353 *l.*	13 *s.*	

Explanation. The Half of 17 *Shillings*, gives 8 *Pieces* of 2 *Shillings*, and 1 *Shilling* remains; I ſay; 8 *Pieces* of 2 *Shillings* multiplied into 9 *Yards*, produce 72 *Pieces* of 2 *Shillings*; I double the 2 belonging to the 72, which makes 4 *Shillings*, and I carry the 7 *Tens* of the *Pieces* of 2 *Shillings*, which are 7 *Pounds*, and join them to the *Product* of the other Figures multiplied by the 8 *Pieces* of 2 *Shillings* each: As for the odd *Shilling* which remained of the 17 *Shillings*, I cut off the firſt Figure of the *Yards* to the *Right-hand*, which is *Shillings*; and take the *Half* of all the others, which gives ſo many *Pounds*.

Multiplication of Pounds, Shillings, *and* Pence, *by a Fraction.*

Example. To how much comes the $\frac{3}{4}$ of a *Pipe* of Wine, or of any thing elſe, at the Price of 15 *Pounds*, 15 *Shillings*, and 9 *Pence*, the whole *Pipe*? This may be done the three following Ways:

The firſt Way is by the *Aliquot Parts.*

$\frac{3}{4}$ of a *Pipe*
at 15 *l.* 15 *s.* 9 *d.* ?

For $\frac{2}{4}$, or $\frac{1}{2}$, you have 7 *l.* 17 *s.* 10 $\frac{1}{2}$ *d.*
For $\frac{1}{4}$, or the Half of $\frac{1}{2}$, 3 *l.* 18 *s.* 11 $\frac{1}{4}$ *d.*

And for the $\frac{3}{4}$ together, 11 *l.* 16 *s.* 9 $\frac{3}{4}$ *d.*

It is no matter which of theſe two *Sums* is ſet down firſt.

You know that $\frac{2}{4}$ is the ſame as $\frac{1}{2}$, and therefore inſtead of $\frac{2}{4}$, take the *Half*, and for $\frac{1}{4}$ you need but take the *Half* of what the $\frac{2}{4}$ amounted to.

Second Way.

Always *divide* the Sum by the *Undermoſt* of the *Fraction*, and *multiply* what that gives by the *Uppermoſt*, produces the Anſwer. Thus dividing 15 *Pounds* 15 *Shillings* 9 *Pence*, by 4 the *Undermoſt* of the *Fraction* $\frac{3}{4}$, (which is done by taking $\frac{1}{4}$ as in the former Way) gives 3 *Pounds* 18 *Shillings* 11 $\frac{1}{4}$ *Pence*; which multiplied by the *Uppermoſt* of the Fraction $\frac{3}{4}$, produces 11 *Pounds* 16 *Shillings* 9 $\frac{3}{4}$ *Pence*, the Anſwer.

Third Way.

This Way is exactly the Reverſe of the Second; for *multiply* the Sum by the *Uppermoſt* of the *Fraction*, and *divide* that Product by the *Undermoſt*, gives the Anſwer. Thus making uſe of the foregoing Example,

3 times	15 *Pounds*	15 *Shil.*	9	*Pence.*
is	47 *Pounds*	7 *Shil.*	3	*Pence.*
of which, the $\frac{1}{4}$, is	11 *Pounds*	16 *Shil.*	9 $\frac{3}{4}$	*Pence.*

the *Anſwer.*

Thus you may *multiply* by, or *take out* for all Sorts of *Fractions*, by all theſe three Ways; and ſince they are all three good, I ſhall leave them to your Choice, to make uſe of which you like beſt.

12 Pence *make* 1 Shil. and 20 Sh. *make* 1 Pound.

1 Pound *is worth* 20 Shil. 1 Shil. *is worth* 12 Pence.

	l.	s.	d.		l.	s.	d.
once	24	18	9	whoever of	249	7	6
and once	24	18	9	pays	24	18	9
and 3 times	24	18	9.	leaves	224	8	9
makes	74	16	3.		24	18	9
4 times	24	18	9.	Diff. betw.	199	10	0
makes	99	15	0.	and	24	18	9.
5 times	24	18	9.	is	174	11	3
makes	124	13	9.		24	18	9
6 times	24	18	9.	Debt	149	12	6
comes to	149	12	6.	Payment	24	18	9.
7 times	24	18	9.	Remainder	124	13	9
comes to	174	11	3.		24	18	9
8 times	24	18	9.	from	99	15	0.
is	199	10	0	taking	24	18	9.
9 times	24	18	9.	leaves	74	16	3
is	224	8	9.	from w^{ch} take	24	18	9.
10 times	24	18	9.	leaves	24	18	9
is	249	7	6.	and	24	18	9.

This Column above, is work'd downwards by *Addition*, or *Multiplication*, and ſerves for both.

This Column above, ſerves both for *Subtraction* and *Diviſion*.

Avoirdupois Weight.

16 *Drams* make 1 *Ounce*, or *Oz.*
16 *Ounces* make 1 *Pound*, or *lb.*
28 *Pounds* make 1 *Quarter*, or *Qr.*
4 *Quarters* make 1 *Hundred Weight*, or *C. wt.*

	C. wt.	*Qrs*	*lb.*	*Oz.*	*Drs.*
Once	113	2	11	10	9
Once	113	2	11	10	9
3 Times	113	2	11	10	9
makes	340	3	6	15	11
4 Times	113	2	11	10	9
makes	454	1	18	10	4
5 Times	113	2	11	10	9
makes	568	0	2	4	13
6 Times	113	2	11	10	9
makes	681	2	13	15	6
7 Times	113	2	11	10	9
makes	795	0	25	9	15
8 Times	113	2	11	10	9
makes	908	3	9	4	8
9 Times	113	2	11	10	9
makes	1022	1	20	15	1
10 Times	113	2	11	10	9
makes	1136	0	4	9	10

Addition, and *Multiplication*, are performed here, in Working downwards from the Top to the Bottom: *Subtraction*, and *Diviſion*, in returning from the Bottom to the Top, *&c.*

Troy

Troy Weight.

24 *Grains* make 1 *Penny Weight*, *P. wt.*
20 *Penny Weights* make 1 *Ounce*, *Oz.*
12 *Ounces* make 1 *Pound*, or *lb.*

	lb.	*Oz.*	*P. wt.*	*Grs.*
Once	115	10	7	5
Once	115	10	7	5
3 Times	115	10	7	5
makes	347	7	1	15
4 Times	115	10	7	5
makes	463	5	8	20
5 Times	115	10	7	5
makes	579	3	16	1
6 Times	115	10	7	5
makes	695	2	3	6
7 Times	115	10	7	5
makes	811	0	10	11
8 Times	115	10	7	5
makes	926	10	17	16
9 Times	115	10	7	5
makes	1042	9	4	21
10 Times	115	10	7	5
makes	1158	7	12	2

This *Table* is drawn up as the *former*, and is to be uſed in the ſame *Manner*.

EXPLANATION

of the foregoing TABLES.

IN each Column you add the *three firſt Sums* together, and the *Fourth* contains the *Sum Total*; to which add the next below it, which is the *Fifth*, and the *Sixth* is the *Total*, *&c.* From the laſt *Sum* take away that which ſtands above it, and you have the Difference, or what *remains*, in the *Sum* next above that, *&c.* Divide the laſt *Sum* by the Number in the Margin, and you will find the *Quotient* to ſtand directly over againſt the *Number* that is in the Margin, and if you *divide* the laſt *Number* by that which is above it, your *Quotient* will be the *Number* in the Margin.

Multiplication of whole Numbers and Fractions, by Pounds, Shillings, and Pence.

To *how much* come	234 $\frac{13}{16}$ *Bales* of *Silk*?
Each *Bale* being valued at	56 *l.* 19 *s.* 9 *d.*
234 *Bales* at 6 *l.* come to	1404 *l.*
at 50 *l.* they come to	1170. *l.* or 11700 *l.*
at 18 *s.* they are worth	210 *l.* 12 *s.*
at 1 *s.* they are worth	11 *l.* 14 *s.*
at 6 *d.* they are worth	5 *l.* 17 *s.*
at 3 *d.* they are worth	2 *l.* 18 *s.* 6 *d.*
$\frac{8}{16}$, or $\frac{1}{2}$ of a *Bale*, is worth	28 *l.* 9 *s.* 10 $\frac{1}{2}$ *d.*
$\frac{4}{16}$, w^{ch} is $\frac{1}{4}$ of a *Bale*, is worth	14 *l.* 4 *s.* 11 $\frac{1}{4}$ *d.*
$\frac{1}{16}$ or the $\frac{1}{4}$ of a *Quarter*, is	3 *l.* 11 *s.* 2 $\frac{13}{16}$ *d.*
234 $\frac{13}{16}$ of a *Bale*, are worth	13381 *l.* 7 *s.* 6 $\frac{2}{16}$ *d.*

Explanation of this Sum.

WE must first multiply the 234 by 56 after the common Way; afterwards we take the *Half* of 19, which gives 9 Pieces of 2 *Shillings* each, to be wrought as before taught in Page 127 and 128; and for the odd *Shilling* which remains, we take the *Half* of the 23 Tens of *Bales*; after that we take out for the 9 *Pence*, by the *Aliquot Parts* of 24, and 12 *Pence*: Laſtly, we take out for the $\frac{13}{16}$ at three times, by the *Aliquot Parts* of 16 (for all even Numbers have *Aliquot Parts*, &c.) But this might have been done by two other Ways, as has been ſhewn in *Multiplication* by a *Fraction*.

BEFORE we add up the nine Products in this Sum, it is proper to find the ſame *Undermoſt* to all the three *Fractions* of a *Penny*, by taking the greateſt *Undermoſt* 16 for the common *Undermoſt* of the three *Fractions*, ſeeing that it can be divided without any Remainder by 2, by 4, and by 16, which are the three *Undermoſts*.

HERE you ought to obſerve, that as you take out of the *Upper* Line for the *Shillings* and *Pence*, in the *Lowermoſt*; by the ſame Reaſon you muſt take out of the *Lower* Line, for the *Fraction* that ſtands in the *Uppermoſt*.

THEREFORE it is a general Rule, never to take out for a *Fraction* upon the *Sum* on the Side of it, nor for *Shillings* and *Pence*, on the Sum by the Side of which they ſtand, or of which they are a Part.

Multiplication of Pounds Shillings and Pence, by Pounds Shillings and Pence.

Example.	*Multiply* 7 *l.* 7 *s.* 7 *d.* by 7 *l.* 7 *s.* 7 *d.*?
The 7 *l.* 7 *s.* 7 *d.* at top *multiplied* by the 7 *l.* below, gives	51 *l.* 13 *s.* 1 *d.*
for 5 of the 7 *s.* in the *bottom* Line, taken out of the *top*, you have	1 *l.* 16 *s.* 10 $\frac{3}{4}$ *d.*
for the other 2 *s.* at *bottom*, you have . . .	14 *s.* 9 $\frac{1}{10}$ *d.*
for 6 of the 7 *d.* *below*, taken out of the *top*, you have	3 *s.* 8 $\frac{11}{40}$ *d.*
and for the other 1 *Penny* at *bottom*, which remains of the 7 *d.* you have	7 $\frac{91}{44}$ *d.*
ſo 7 *l.* 7 *s.* 7 *d.* *multiplied* by 7 *l.* 7 *s.* 7 *d.* produce	54 *l.* 9 *s.* -- $\frac{121}{240}$ of a *Penny* exactly.

THE Product of this *Example*, is the Square of 7 *Pounds* 7 *Shillings* 7 *Pence*; for altho' Money is not ſquar'd, and *Pounds Shillings* and *Pence* are not multiplied by a Sum of the ſame Kind; yet when a Sum is remitted from *France* to *England*, or *Holland*, &c. you muſt multiply the *French* Money by the *Engliſh* or *Dutch*, and counting the *French Crown* at 20 *Sols*, of 12 *French Pence* each, you muſt triple the *Sols*, and *French Pence*, and proceed according to the preceding or following *Examples* of Multiplication, by reducing the *Engliſh* and *Dutch Pence* into *Sols* and Parts.

Another Example.

Multiply by	224 *l.* 10 *s.* 6 *d.* 167 *l.* 5 *s.* 4 *d.*
The 224 *l.* at *top* multiplied by the 7 *l. below*, gives	1568 *l.*
by the 60 *l. below*, gives	1344 *l.*
by the 100 *l. below*, makes	224 . . *l.*
For the 10 *s.* at *top*, the ½ of all the Sum at *bottom*, is	. . . 83 *l.* 12 *s.* 8 *d.*
It is difficult to take the 6 *d.* at *top* out of all the *bottom*, but it may be readily taken out of the *last* Line, and is	. . . 4 *l.* 3 *s.* 7 ¼ *d.*
For the 5 *s. below*, taken out of the 224 *l.* at *top*, you have	. . . 56 *l.*
For the 4 *d. below*, taken out of the 224 *l.* at *top*, you have	. . . 3 *l.* 14 *s.* 8 *d.*
So 224 *l.* 10 *s.* 6 *d.* mult. by 160 *l.* 5 *s.* 4 *d.* gives	37555 *l.* 10 *s.* 11 ⅗ *d.*

THESE two *Examples*, eſpecially the laſt, are very difficult this Way; which by reaſon of its having the feweſt Figures appears to be the ſhorteſt, but is quite the contrary, becauſe it requires too much Time to conſider, and too much Attention to prevent making Miſtakes. Wherefore we ſhall give it no further *Explanation*, ſince you will find hereafter in *Diviſion* of *Pounds Shillings* and *Pence*, ſuch Rules as are much more eaſy in the Working all Sorts of *Multiplication* and *Diviſion*, however difficult and compound the Sums may be: Indeed the following Methods will require more Figures, but then they are performed in leſs Time, ſo that we may conclude them the ſhorteſt and beſt, ſince they are more expeditious, as well as more eaſy.

Multiplication of *Pounds Shillings* and *Pence*, by *Pounds Shillings* and *Pence*, is ſeldom required, except in *Exchanges* of *Foreign Money*.

BEFORE we proceed to *Diviſion* of *Pounds Shillings* and *Pence*, we'll give you an *Example* in multiplying of *Pounds Shillings* and *Pence*, after ſeveral Ways, both long and ſhort, that you may take your Choice.

Firſt Method.

At 7897 *l.* 19 *s.* 11 *d.* per *Share,*
to *How much* come 5432 *Shares ?*

59752 *d.* of which the $\frac{1}{12}$

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taken at once, gives 4979 *s.* 4 *d.*
at 9 *s.* the 5432, come to 48888 *s.* and,
at 10 *s.* they come to 5432. *s.* and,

---

at 19 *s.* 11 *d.* they are worth 10818.7 *s.* 4 *d.*

---

of which the $\frac{1}{20}$ is 5409 *l.* 7 *s.* 4 *d.*
2 *Shares* at 7897 *l.* come to 15794 *l.*
30 *Shares* at 7897 *l.* amount to 23691. *l.*
400 *Shares* at 7897 *l.* make 31588.. *l.*
5000 *Shares* at 7897 *l.* make 39485... *l.*

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and the 5432 *Shares* at
7897 *l.* 19 *s.* 11 *d.* come to 42901913 *l.* 7 *s.* 4 *d.*

HERE I *multiply* the 5432 firſt by 11 *d.* which gives 59752 *Pence* ; and this I bring into *Shillings* by *dividing* it by 12, to which I add the two Products of 5432 into 9 *Shillings* and 10 *Shillings* ; this Sum I *divide* by 20 to bring it into *Pounds*, and then I proceed to *multiply* the 5432 by 7897 *Pounds*, as in *ſimple Multiplication*. (See Page 109.)

Second Method.

At 7897 *l.* 19 *s.* 11 *d.*
to *How much* come 5432 *Integers?*

Product of 2 *Units*	15794 *l.*		
Product of 3 *Tens*	236910 *l.*		
Product of 4 *Hundreds*	3158800 *l.*		
Product of 5 *Thouſands*	39485000 *l.*		
Product of 10 *Shillings*	2716 *l.*		
Product of 4 *Shillings*	1086 *l.*	08 *s.*	
Product of 4 *Shillings*	1086 *l.*	08 *s.*	
Product of 1 *Shilling*	271 *l.*	12 *s.*	
Product of 6 *Pence*	135 *l.*	16 *s.*	
Product of 3 *Pence*	67 *l.*	18 *s.*	
Product of 2 *Pence*	45 *l.*	05 *s.*	4 *d.*
	42901913 *l.*	7 *s.*	4 *d.*

HERE I begin with the *Pounds*, and having multiplied 7897 *l.* by 5432; I take ½ of 5432 for 10 *s.* &c. (as is ſhewn in Page 115, &c.): Then I take out for 11 Pence by the *Aliquot Parts* of 1 *Shilling.* (See Page 122, *&c.*)

Third Method. At 7897 *l.* 19 *s.* 11 *d.*
to *How much* come 5432 *Integers ?*

All the *Sum* at *top* counted					
twice, or by 2, comes to	15794 *l.*	. . and	. . . . 38 *s.*	and	. . . 22 *d.*
counted 30 times, makes	236910 *l.*	. . and	. . . 570 *s.*	and	. . 330 *d.*
counted 400 times, makes	3158800 *l.*	. . and	. . 7600 *s.*	and	. 4400 *d.*
counted 5000 times, makes	39485000 *l.*	. . and	. 95000 *s.*	and	55000 *d.*
	Prod. of the *Pen.*		4979 *s.* 4 *d.*		59752 *d.*
Product of all the *Shillings* and *Pence.*	5409 *l.* 7 *s.* 4 *d.*		10818.7 *s.* 4 *d.*		4979 *s.* 4 *d.*
Anſwer,	42901913 *l.* 7 *s.* 4 *d.*		5409 *l.* 7 *s.* 4 *d*		

Fourth Method. At 7897 *l.* 19 *s.* 11 *d.*
To *How much* come 5432 *Integers ?*

		Table.
2 times 7897 *l.* 19 *s.* 11 *d.* is	15795 *l.* 19 *s.* 10 *d.*	19 *s.* 11 *d.*
30 times 7897 *l.* 19 *s.* 11. *d.* is	23693.9 *l.* 17 *s.* 6 *d.*	9 *l.* 19 *s.* 2 *d.*
400 times 7897 *l.* 19 *s.* 11 *d.* is	31591.98 *l.* 06 *s.* 8 *d.*	99 *l.* 11 *s.* 8 *d.*
5000 times 7897 *l.* 19 *s.* 11 *d.* is	39489.979 *l.* 03 *s.* 4 *d.*	995 *l.* 16 *s.* 8 *d.*
and 5432 times 7897 *l.* 19 *s.* 11 *d.* comes to	42901913 *l.* 07 *s.* 4 *d.*	*Anſwer.*

THE *third Method* is ſo plain as to need no *Explanation.*

IN the *fourth Method*, I compoſe a little *Table* after this Manner; I multiply 19*s.* 11 *d.* by 10, which gives 9 *l.* 19*s.* 2 *d.*; this I again multiply by 10, which makes 100 times 19*s.* 11 *d.* or 99 *l.* 11 *s.* 8 *d.*; and this laſt I likewiſe multiply by 10, which produces 995 *l.* 16 *s.* 8 *d.* or 1000 times 19 *s.* 11 *d.*—Then for the *Operation*, I multiply the Sum 7897 *l.* 19 *s.* 11 *d.* by 2 as uſual; then coming to the 3, which ſignifies 30, I multiply 9 *l.* 19 *s.* 2 *d.* (which is 10 times 19 *s.* 11 *d.*) by 3, which gives 29 *l.* 17 *s.* 6 *d.* I only ſet down 9 *l.* 17 *s.* 6 *d.* and carry the two to 3 times 7, which is 21, and 2 which I carried makes 23, *&c.* finiſhing the reſt of the Line as uſual. For the 4, which is 400, I multiply 99 *l.* 11 *s.* 8 *d.* (which is 100 times 19 *s.* 11 *d.*) by 4, and this produces 398 *l.* 6 *s.* 8 *d.* I only write 98 *l.* 06 *s.* 8 *d.* carrying the 3 to 4 times 7, which makes 28, and 3 is 31, finiſhing this Line as in common *Multiplication.*

FOR the next Line I multiply 995 *l.* 16 *s.* 8 *d.* (which is 1000 times 19 *s.* 11 *d.*) by 5, and this gives 4979 *l.* 3 *s.* 4 *d.* I only ſet down 979 *l.* 3 *s.* 4 *d.* keeping the 4 in Mind, and I ſay; 5 times 7 makes 35, and 4 makes 39, and finiſh the reſt as uſual. But there is one *Method* yet remaining, *viz.* by the *Aliquot Parts* of 2 *Shillings*, by which I ſhall work this *Example*, and then proceed to *Diviſion* of *Pounds Shillings* and *Pence.*

The Fifth and beſt Method.

At 7897 *l.* 19 *s.* 11 *d.*
to *How much* come 5432 *Integers?*

15794 *l.*	for 2 *Units.*
236910 *l.*	for 3 *Tens.*
3158800 *l.*	for 4 *Hund.*
39485000 *l.*	for 5 *Th*^{nds}.
4888 *l.* 16 *s.*	for 18 *Shil.*
271 *l.* 12 *s.*	for 1 *Shil.*
181 *l.* 01 *s.* 4 *d.*	for 8 *Pence.*
67 *l.* 18 *s.*	for 3 *Pence.*
42901913 *l.* 7 *s.* 4 *d.*	for the *Sum.*

Total of the 8 particular Products.

OF theſe five different *Methods* this laſt is the beſt and ſhorteſt, and which we recommend to your Practice: You may find it explain'd at large after the *Aliquot Parts.* (See Page 127 and 128.)

Diviſion of Pounds, Shillings, and Pence.

To divide, or part equally, 49 *Pounds* 14 *Shillings* 4 *Pence* between 4 Perſons; only take the *Fourth* Part, which gives 12 *Pounds* 8 *Shillings* 7 *Pence* to each Perſon, which is done, by ſaying; the *Fourth* Part of 4 *Tens* is one *Ten*, the *Fourth* Part of 9 *Pounds* is 2 *Pounds*, and there remains 1 *Pound* of 20 *Shillings*, which with the 14 *Shillings*, makes 34 *Shillings*, the *Fourth* Part of which is 8 *Shillings*, and there remain 2 *Shillings*, which with the 4 *Pence*, makes 28 *Pence*; the *Fourth* Part of which is juſt 7 *Pence*. To prove it, ſay; 4 times 7 *Pence*, makes 2 *Shillings* and 4 *Pence*; I ſet down the 4 *Pence*, and keep the 2 *Shillings* in my Mind; then 4 times 8 *Shillings* is 32 *Shillings*, and the 2 *Shillings* I kept in my Mind, make 34 *Shillings*, or 1 *Pound* 14 *Shillings*; I ſet down the 14 *Shillings*, and carry the 1 *Pound* to the 4 times 12 *Pounds*, which ſhews 49 *Pounds* 14 *Shillings* 4 *Pence*, as at top.

		l.	*s.*	*d.*
Sum	Of	49 :	14 :	4.
The *Fourth* Part, is		12 :	8 :	7.

When the *Diviſor* has no *Fraction*, and it does not exceed 12, every *Diviſion* of *Pounds Shillings* and *Pence* is wrought after this *Method*, which is the ſhorteſt and the eaſieſt.

BUT becauſe the *Diviſor* is not always leſs than 12, but is frequently 3, 4, or more *Figures*, and is too difficult to be done after this *Method* above; I ſhall therefore ſhew you ſeveral *Ways* to work by in that Caſe, making uſe of the laſt Example.

The firſt Way.

HAVING *divided* the 49 *Pounds* by 4, I have 12 *Pounds*, and 1 *Pound* remains, which with the 14 *Shillings*, makes 34 *Shillings*; which I alſo divide by 4, and it gives in the *Quotient* 8 *Shillings*, and 2 *Shillings* remain, which added to the 4 *Pence*, makes 28 *Pence*; which I in the ſame Manner divide by 4, and it gives 7 *Pence*: So you find in the *Quotients* of the 3 *Diviſions*, 12 *Pounds* 8 *Shillings* 7 *Pence*, the Part belonging to each particular Perſon.

```
       l.   s.   d.   l.
4)    49 : 14 : 4  ( 12
       4
      ---
       9
       8
      ---
       1 Pound.
      20 s.
      ---
4)    34 ( 8 s.
      32
      ---
       2 Shil.
      12 d.
      ---
4)    28 ( 7 d.
      28
      ---
       0
```

Second Way.

To *divide* equally between 4 *Perſons* the Sum of 49 *Pounds* 14 *Shillings* 4 *Pence*; *reduce* the whole Sum into the leaſt *Species*, (that is to ſay) into *Pence*; which you will find to be 11932 *Pence*, to be *divided* by 4 *Perſons*, or of which the $\frac{1}{4}$ will be 2983 *Pence* for each Perſon, which you *reduce* into *Shillings*, by taking the $\frac{1}{12}$, which gives 248 *s.* 7 *d.* which are turned into *Pounds* by taking the $\frac{1}{20}$, which gives 12 *Pounds* 8 *Shillings* 7 *Pence* for each Perſon, as above.

Operation.

The *Sum* to be *divided* is	49 *l.* 14 *s.* 4 *d.*
49 *l.* 14 *s.* make	994 *Shillings.*
994 *s.* 4 *d.* make	11932 *Pence.*
This *divided* by 4 is	2983 *Pence.*
Which brought into *Shil.* (by *dividing* by 12) makes	248 *s.* 7 *d.*
And 248 *s.* *divided* by 20 is	12 *l.* 8 *s.* 7 *d.*

Third Way.

LASTLY, to *divide* 49 *Pounds* 14 *Shillings* 4 *Pence*, between 4 *Perſons*; you may conſider the 4 Perſons in the *Diviſor* as 4 *Pounds*, which you may bring firſt into *Shillings*, and then into *Pence*, as well as the *Sum* to be *divided*: So 49 *Pounds* 14 *Shillings* 4 *Pence*, being 11932 *Pence*, are to be divided by 4 Perſons, conſidered as 4 *Pounds*, which are 960 *Pence*.

THE Reaſon of this is, that as you augment the Sum to be *divided*, by *reducing* it all into *Pence*, (that you may have no *Fractions* to *divide*, for the Shillings and Pence, following the Pounds, are its *Fractions*) you muſt in *Proportion* augment the *Diviſor* as much, and as many Times, by *reducing* that alſo into *Pence*.

LET us then *divide* 11932 *Pence*, by 960 *Pence*, or rather 11932 *Pounds*, by 960 *Perſons*; for 960 *Perſons* having 11932 *Pounds* to be equally *divided* amongſt them, would have no more apiece, than 4 *Perſons* with 49 *Pounds* 14 *Shillings* and 4 *Pence* between them; becauſe the ſame Proportion has been kept in turning both the Sums into *Pence*, that is to ſay, in increaſing them both, one as much as the other.

YOU ſee here, that when you have *divided* the *Pounds*, what remains is *Pounds*, which you muſt turn into *Shillings*, in multiplying them by 20, the *Shillings* in one *Pound*; and after you have divided the *Shillings*, what remain are *Shillings*, which you muſt turn into *Pence*, in multiplying them by 12 at once, the *Pence* in one *Shilling*, and divide every Time by the ſame *Diviſor*.

Operation.

```
Perſons ) Pounds ( Pounds
    960 ) 11932  ( 12
          960
          ----
          2332
          1920
          ----
Remain     412 Pounds
            20 Shillings in 1 l.
          ----
  96|0 )  824|0 ( 8 Shillings
          768
          ---
           56 Shillings
           12 Pence in 1 Shilling
          ---
    96 )  672 ( 7 Pence
          672
          ---
            0
```

Anſwer 12 *l.* 8. *s.* 7 *d.*

MOREOVER, you may obſerve, that when there are any *Cyphers* at the End of the *Dividend* and *Diviſor*, you may cut off the ſame *Number* of o's from each, be they one, two, or more, which is taking the *Tenth*, or *Hundredth* Part of each Sum; and afterwards you may divide; for the Proportion being kept, by Conſequence the *Quotient* muſt always be the ſame.

BUT inſtead of theſe three *Diviſions* you need but one; for only double the *Pounds* that remain, and ſet them under the *Remainder*, with a o join'd to them, which makes 8240 *Shillings*, to be divided by the ſame *Diviſor* 960; and the *Shillings* which remain, *multiply* alſo by 12 *Pence* at once, and ſet down the Product, and then divide on as before.

Example

Example.

Perſons) Pounds (*l.* *s.* *d.*
960) 11932 (12 : 8 : 7 *Anſwer.*
960
2332
1920
412 Pounds,
or 8240 Shillings.
7680
560 Shillings,
or 6720 Pence.
6720
0

Lastly, inſtead of ***reducing*** the ***Pounds*** which remain into *Shillings*, and the *Shillings* which remain into *Pence*, you need only take the *Twentieth* Part of the *Diviſor*, 960, that gives 48, by which *divide* the 412 *Pounds* remaining; and the *Quotient* will be 8 *Shillings*, without any more to do,

Then for the *Remainder*, which is 28 *Shillings*, you may inſtead of multiplying them by 12, to turn them into *Pence*, divide the laſt *Diviſor* 48, which was the *Diviſor* for the *Shillings*, by 12, which gives 4, for a *Diviſor* to the 28 *Shillings*; whereby you'll have in the *Quotient* 7 *Pence* without any further Trouble, as you may ſee in the following Example.

Second Example.

Div.r *Rem.r*

$\frac{1}{20}$ *of* 960 *is* 48) 412 (8 Shillings.

384

$\frac{1}{12}$ *of* 48 *is* 4) 28 (7 Pence.

28

0

THIS Way of *dividing*, by which you obtain *Pounds Shillings* and *Pence*, without touching the *Remainders*, either to multiply by 20, or by 12, is very pretty and very eaſy; for there is no more Difficulty in taking the *Twentieth* and *Twelfth*, than there is in *multiplying* by 20, and by 12.

THIS *Method* indeed is general, but not always the readieſt and eaſieſt, as it is in the *Example* above: Wherefore, when you ſee you cannot take the *Twentieth* and the *Twelfth* exactly without a *Remainder*, then the common Way is the ſhorteſt and beſt; for the *Fractions* that would ariſe by taking the *Twentieth* and *Twelfth* of the *Diviſor*, would be too troubleſome, and are to be avoided as much as poſſible. However, when the laſt *Figure* of the *Diviſor* is a 0, and the *Figure* before it is an even *Number*, you may be ſure you need never *multiply* the *Remainder* of the *Pounds* by 20, to turn them into *Shillings*, &c.

Diviſion of Pounds, Shillings, and Pence, by a Fraction.

MULTIPLY the Sum given by the *undermoſt* of the *Fraction*, and *divide* that Product by the *uppermoſt*; or otherwiſe, *divide* the Sum by the *uppermoſt*, and *multiply* the *Quotient* that ariſes by the *undermoſt*, and you will have the *Anſwer*.

Example.

IF $\frac{5}{6}$ *of a* Tun *of* Oil *coſts* 24 Pounds 18 Shillings 9 Pence; *What is the* Price *of the whole* Tun?

Operation.

6 Times 24 Pounds 18 Shillings 9 Pence
makes 149 Pounds 12 Shillings 6 Pence.

The $\frac{1}{5}$ *of which, is* 29 Pounds 18 Shillings 6 Pence.

Otherwiſe, of 24 Pounds 18 Shillings 9 Pence
the $\frac{1}{5}$ *is* 4 Pounds 19 Shillings 9 Pence.
Which multiply by - - - 6

produces 29 Pounds 18 Shillings 6 Pence.

THUS by theſe two Ways you find, that when $\frac{5}{6}$ of a *Tun* of *Oil* coſts 24 *Pounds* 18 *Shillings* 9 *Pence*; the whole *Tun* comes to 29 *Pounds* 18 *Shillings* 6 *Pence*. For Proof, you need but work the *Queſtion* back again, without uſing any other *Figures* than what you have already down, in multiplying the *Quotient* 29 *Pounds* 18 *Shillings* 6 *Pence*, by the *Diviſor* 5; which again produces the 149 *Pounds* 12 *Shillings* 6 *Pence*, that are above; of which the *ſixth Part* is 24 *Pounds* 18 *Shillings* 9 *Pence*, as at top.

AND by the other Way; the *ſixth Part* of the *Quotient* 29 *Pounds* 18 *Shillings* 6 *Pence*, is 4 *Pounds* 19 *Shillings* 9 *Pence*, as above; which being *multiplied* by 5, gives the 24 *Pounds* 18 *Shillings* 9 *Pence*, at top.

THUS you ſee, 'tis the beſt Way to work the Proof of *Multiplication* and *Diviſion*, along with the Sum; and as ſoon as ever you have produc'd a Line in *Multiplication*, prove it by *Diviſion*, before you go any farther; and never work any *Operation* of *Diviſion*, without proving it forthwith by its Contrary, which is *Multiplication*. Now, in this Way you can never fail of a true *Anſwer*; for, if you be miſtaken in any Part, thro' ſome wandering of the Mind or otherwiſe, you immediately perceive your Error, and correct it before you proceed any further. Nevertheleſs, in the following *Examples* of *Diviſion*, we ſhall give you the Proof, wrought ſeparately from the Sum, that thereby you may have ſome *Multiplication* Sums which were omitted on Purpoſe, becauſe they are the moſt difficult, and require you to underſtand *Diviſion* well, before you can do them.

Diviſion of Pounds Shillings and Pence, when the Diviſor has a Fraction.

If $4\frac{3}{4}$ Ells *coſt* 12 Pounds 5 Shillings 3 Pence, *what coſt* 1 Ell?

Multiply 12 *Pounds* 5 *Shillings* 3 *Pence*, by the *undermoſt* of the *Fraction* $\frac{3}{4}$ of an *Ell*, which gives 49 *Pounds* 1 *Shilling* to be divided, inſtead of the 12 *Pounds* 5 *Shillings* 3 *Pence* : Alſo multiply the 4 *Ells* by the ſame 4, and to the Product 16, add 3 the *uppermoſt*, makes 19 for a *Diviſor*, inſtead of the $4\frac{3}{4}$ *Ells* : Afterwards *divide* 49 *Pounds* 1 *Shilling* by 19, gives in the *Quotient*, 2 *Pounds* 11 *Shillings* 7 *Pence*, $\frac{11}{19}$ of a *Penny*, the Value of one *Ell*, at the ſame Rate as the $4\frac{3}{4}$ *Ells*.

Diviſor	$4\frac{3}{4}$	12 *l.* 5 *s.* 3 *d.*		*Dividend.*
by	4	*mult.* by 4		
	19)	49 *l.* 1 *s.* .	(2 *l.* 11 *s.* $7\frac{11}{19}$ *d.*	
		38		
Remain		11 *l.* 1 *s.*		
or		221 *Shillings.*		
		19		
		31		
		19		
Remain		12 *Shillings,*		
or		144 *Pence,*		
		133		
		11		

For Proof.

Multiply the *Quotient*	2 *l.* 11 *s.* $7\frac{11}{19}$ *d.*
by the *Diviſor*	$4\frac{3}{4}$ *Ells.*
The 4 *Ells* produce	10 *l.* 06 *s.* $6\frac{6}{19}$ *d.*
The $\frac{3}{4}$, or $\frac{1}{2}$ of an *Ell* gives	1 *l.* 05 *s.* $9\frac{15}{19}$ *d.*
For $\frac{1}{4}$, or $\frac{1}{2}$, of the $\frac{1}{2}$,	12 *s.* $10\frac{17}{19}$ *d.*
And for the $4\frac{3}{4}$ *Ells.*	12 *l.* 5 *s.* 3 *d.* exactly.

THIS *Diviſion* is otherwiſe performed, by *reducing* the *Dividend* 12 *Pounds* 5 *Shillings* 3 *Pence*, all into *Pence*, amounting to 2943; which *multiplied* by the 4 of the $\frac{1}{4}$, make 11772 *Quarters* of a *Penny*; which *divided* by 19 *Quarters* of an *Ell*, gives in the *Quotient* of the *Diviſion*,

	619 Pence, $\frac{11}{19}$ *of a* Penny.
which are	5· 1 *s.* $7\frac{11}{19}$ *d.*
that make	2 *l.* 11 *s.* $7\frac{11}{19}$ *d.*

Otherwiſe ſtill.

CONSIDERING $4\frac{3}{4}$ *Ells*, as 4 *Pounds*, and $\frac{3}{4}$ of a *Pound*, or 4 *Pounds* 15 *Shillings*; which reduc'd into *Pence*, come to 1140 *Pence*, for a *Diviſor* : And 12 *Pounds* 5 *Shillings* 3 *Pence*, being alſo reduc'd into *Pence*, give 2943 *Pence*, the Sum to be *divided*: Then *divide* the one by the other, gives 2 *Pounds* 11 *Shillings* 7 *Pence* $\frac{11}{19}$ of a *Penny*, as before.

Opera-

Operation.

Pence Pence
$\frac{1}{20}$ *of* 1140) 2943 (2 *l.*
2280
is 57) 663 (11 *s.*
57
93
57
36 *s.*
57) 432 *d.* ($7\frac{33}{57}$ *or* $\frac{11}{19}$ *d.*
399

AFTER you have *divided*, and produc'd the *Pounds* in the *Quotient*; then take the *Twentieth* Part of the *Diviſor*, which is 57, by which you divide the Remainder of the *Pounds*, as *Shillings*; and the *Shillings* that *remain* you had better multiply by 12 *Pence*, becauſe you can't take exactly the *Twelfth* Part of the *Diviſor* 57, &c.

Diviſion of Pounds Shillings and Pence, with a Fraction of a Penny, by a Diviſor, which has alſo a Fraction.

If $35\frac{2}{3}$ Pieces *of Cloth coſt* 883 Pounds 15 Shillings 9 Pence, *and* $\frac{2}{3}$ *of a* Penny; How much *is that per* Piece?

Anſwer. 24 *Pounds* 15 *Shillings* 7 *Pence*, exactly.

SUM.

INSTEAD of 883 *Pounds* 15 *Shillings* $9\frac{2}{3}$ *Pence*, to be *divided* by $35\frac{2}{3}$; ſet down the *Triple* of it, 2651 *Pounds* 7 *Shillings* 5 *Pence*, to be *divided* by 107, the *Triple* of $35\frac{2}{3}$.

Operation.

```
              l.     s.  d.      l.    s.   d.
        107 )2651  :  7 : 5(    24  :  15  : 7
             214
            ----
             511
             428
            ----
Remain        83 l  7 s.
  or        1667 Shillings
             107
            ----
             597
             535
            ----
Remain        62 s.  5 d.
  or         749 Pence.
             749
            ----
               0
```

Expla-

Explanation.

BECAUSE it would be too difficult to *divide* a Sum where there is a *Fraction*, by another that has a *Fraction* alſo, as in the Example above; you muſt *multiply* each Sum by the *undermoſt* of the *Fraction*, and to the *Product* add the *uppermoſt* of this *Fraction*, that the *Product* may be a Sum having no *Fraction*, and thereby be the more eaſily *divided*.

TO *reduce* each of the two Sums above into its *Fraction*, I ſay; 3 times 5 *Pieces*, makes 15 *Thirds*, which with the *Uppermoſt*, makes 17 *Thirds*; I ſet down 7, and carry the 1 to 3 times 3 making 10, to be ſet down on the Side of the 7, which makes 107 *Thirds*. Afterwards coming to the Sum to be *divided*, I ſay; 3 times 9 is 27 *Pence*, and the *Uppermoſt* of the *Fraction*, makes 29 *Pence*, or 29 *Thirds* of a *Penny*; which are to be look'd upon as 29 *Pence*, equal to 2 *Shillings* and 5 *Pence*, and keep the 2 *Shillings* in Mind; after that, 3 times 15 is 45 *Shillings*, and 2 that I carry, makes 47 *Shillings*, or 2 *Pounds* 7 *Shillings*: I ſet down the 7 *Shillings*, and carry the 2 *Pounds* to 3 times 883 *Pounds*, which gives 2651 *Pounds* 7 *Shillings* 5 *Pence*, to be *divided* by 107, *&c.*

HERE you may obſerve, that if the *Fractions* of the two Sums have not the ſame *Undermoſt*, you muſt bring them both into one *Denomination*, after the Manner explained in the foregoing *Treatiſe* of *Fractions*; and this muſt be done before you begin to *reduce* either Sum.

Another Example.

If 24 $\frac{2}{3}$ Pieces *coſt* 52 Pounds 15 Shillings 9 $\frac{1}{2}$ Pence; *what coſt* 1 Piece?

HAVING found the ſame *Undermoſt* to both the *Fractions* $\frac{2}{3}$, and $\frac{1}{2}$, by *multiplying* them croſswiſe, which gives $\frac{4}{6}$ and $\frac{3}{6}$ in their Place, you may afterwards turn the 24 $\frac{4}{6}$ all into *Sixths*, which gives 148 for a *Diviſor*; and then turning the 52 *Pounds* 15 *Shillings* 9 *Pence*, all into Sixths of *Pounds Shillings* and *Pence*, you will have 316 *Pounds* 14 *Shillings* 9 *Pence*, to be *divided* by 148, which produces in the *Quotient*, 2 *Pounds* 2 *Shillings* 9 *Pence*, $\frac{93}{148}$ of a *Penny*, the Value or Price of each particular Piece.

		l.	*s.*	*d.*				
Diviſor 24 $\frac{2}{3}$)		52 :	15 :	9 $\frac{1}{2}$ (	*l.*	*s.*	*d.*	
by 6		*mult.* by 6						
148)		316 :	14 :	9 *d* (	2 :	2 :	9 $\frac{93}{148}$.	
		296						
Remain		20 *l.* 14 *s.*						
or		414 Shillings.						
		296						
Remain		118 *s.* 9 *d.*						
or		1425 Pence						
		1332						
Remain		93 *d.*						

Proof.

To work the *Proof* ſeparately from the Sum, you muſt *reduce* the *Diviſor* 24 $\frac{2}{3}$ Pieces, into $\frac{74}{3}$ of a *Piece*; and the *Quotient* 2 *Pounds* 2 *Shillings* 9 *Pence* $\frac{93}{148}$, into $\frac{76017}{148}$ of a *Penny*; afterwards multiplying the *Uppermoſts* of theſe two great *Fractions* into one another, gives 5625258, the *Number* to be *divided*: Then multiplying the two *Undermoſts* together, gives 444 for a *Diviſor*: Laſtly, dividing 5625258 by 444, gives 12669 $\frac{222}{444}$, or $\frac{1}{2}$ of a *Penny*, of which the 12th is 1055 *Shillings* 9 $\frac{1}{2}$ *Pence*, which are equal in Value to 52 *Pounds* 15 *Shillings* 9 $\frac{1}{2}$ *Pence*. Thus you ſee the Way of working the moſt difficult and moſt compounded *Multiplications*; in which you may obſerve, there is no Neceſſity of finding the ſame *Undermoſts*, as you muſt do to work *Diviſion*.

Operation.

42 *s.* 9 $\frac{93}{148}$ *d.* | 24 $\frac{2}{3}$ *Ells,*
513 *d.* | make 74
148 | *Thirds* 3
93
4104
2052.
513..
76017 148*tks.*

Multiply the *Uppermoſt* 76017
by the *Uppermoſt* 74

and the *Undermoſt* 148 | 304068
by the *Undermoſt* 3 | 532119.

Diviſor 444 of 5625258

Then *divide*

444) 5625258 (12669 $\frac{1}{2}$ *Pence*
444 | 105 . 5 *s.* 9 $\frac{1}{2}$ *d.*
1185 | 52 *l.* 15 *s.* 9$\frac{1}{2}$ *d.* *Anſwer.*
888
2972
2664
3085
2664
4218
3996
222

Diviſion of Pounds Shillings and Pence, by Pounds Shillings and Pence.

Example. With 18 Pounds 18 Shillings 9 Pence, *having gained* 55 Pounds 5 Shillings 6 Pence: *How much is gained by one* Pound?

To anſwer this *Queſtion*, you find that 55 *Pounds* 5 *Shillings* 6 *Pence* are equal in Value to 13266 *Pence*; which being *divided* by 18 *Pounds* 18 *Shillings* 9 *Pence*, reduc'd alſo into 4545 *Pence*, gives in the *Quotient*, 2 *Pounds* 18 *Shillings* 4 *Pence*, and $\frac{2340}{4545}$ of a *Penny*, which is *reduc'd* by 5, and by 9, into $\frac{52}{101}$ of a *Penny*. The Operation being eaſy, we ſhall content our ſelves with having only explained the *Manner* thereof.

To work the *Proof* ſeparately: We have already found that the *Diviſor*, 18 *Pounds* 18 *Shillings* 9 *Pence*, contains 4545 *Pence*, that is to ſay, $\frac{4545}{240}$ of a *Pound*, becauſe there are 240 *Pence* in a *Pound*, which is here look'd upon as an *Integer*: Then reducing the *Quotient*, 2 *Pounds* 18 *Shillings* 4 *Pence*, $\frac{52}{101}$, into its *Fraction*, gives $\frac{70752}{101}$ of a Penny, to be *multiplied* by $\frac{4545}{240}$ of a Pound.

MULTIPLYING then theſe two *Uppermoſts* into one another, gives 321567840, the *Number* to be *divided*; alſo multiplying the two *Undermoſts* together, gives 24240, for a *Diviſor*; and *dividing* theſe two Sums by one another, gives in the *Quotient*, 13266 *Pence*; making 1105 *Shillings* 6 *Pence*, equal to 55 *Pounds* 5 *Shillings* 6 *Pence*, which ſerves for a *Proof*.

Diviſion

Diviſion of Pounds Shillings Pence and a Fraction of a Penny, by Pounds Shillings and Pence.

If 10 Pounds 10 Shillings 10 Pence *gain* 27 Pounds 15 Shillings 7 Pence and $\frac{29}{48}$ *of a* Penny; how much *does* 1 Pound *gain*?

YOU muſt bring the 10 *Pounds* 10 *Shillings* 10 *Pence*, into 2530 Pence; which *multiplied* by 48, the *Undermoſt* of the *Fraction* of the *Dividend*, will produce 121440, for a *Diviſor*: In like manner you muſt bring the 27 *Pounds* 15 *Shillings* 7 *Pence*, $\frac{29}{48}$ of a *Penny*, all into 48*ths* of a *Penny*, adding to the Product 29 the *Uppermoſt*, which gives 320045 to be *divided*: And working the *Operation*, you will find the *Anſwer* to be 2 *Pounds* 12 *Shillings* 8 ½ *Pence*; which 1 *Pound* gains. Here you may obſerve, that all theſe *Reductions* are made, only to augment both theſe Sums equal in *Proportion* to their Greatneſs, and by this Means to be able to *divide* the greateſt without a *Fraction*, by the leaſt without a *Fraction*.

Operation.

$\frac{1}{20}$ *of*	121440)	320045 (	2 Pounds.
		242880	
is	6072)	77165 (	12 Shillings.
		6072	
$\frac{1}{12}$ *of*	6072	16445	
gives the		12144	
Diviſor	506)	4301 (	8 ½ *Pence*.
		4048	
		253	

SEEING the common *Diviſor* may be *divided* exactly by 20, and that you may take the 12*th* Part of this 20*th* alſo, without a *Remainder*; we take them in order to ſhorten the Work, rather than *multiply* the *Remainder* of the *Pounds* by 20 *Shillings*, and the *Shillings* that remain by 12 *Pence*.

Diviſion of Pounds Shillings Pence with a Fraction of a Penny, by Pounds Shillings Pence and a Fraction of a Penny.

To divide 27 Pounds 15 Shillings 7 $\frac{29}{48}$ Pence, *by* 2 Pounds 12 Shillings 8 $\frac{1}{2}$ Pence?

Firſt of all, you muſt give your *Fractions* the ſame *Undermoſts* thus; multiplying the *Uppermoſt* and *Undermoſt* of one *Fraction* by the *Undermoſt* of the other, each in his Turn, you will have $\frac{58}{96}$, and $\frac{48}{96}$, inſtead $\frac{29}{48}$, and $\frac{1}{2}$; ſo that you will have 27 *Pounds* 15 *Shil- Shillings* - $\frac{58}{96}$ *Pence*, to be divided by 2 *Pounds* 12 *lings* 8 $\frac{48}{96}$ *Pence*. Wherefore, now you have nothing more to do, than to turn each Sum into its *Fraction*, adding its *Uppermoſt* to the Product; and afterwards dividing the greateſt by the leaſt, which gives in the *Quotient*, 10 *Pounds* 10 *Shillings* 10 *Pence*.

Operation.

Operation.

27 *Pounds* 15 *Shillings* 7 $\frac{58}{96}$ *Pence*, make 640090 (96*ths* of a *Penny*); to be *divided* by 60720, (96*ths* of a *Penny*) which is the Value of 2 *Pounds* 12 *Shillings* 8 $\frac{48}{96}$ *Pence*.

$\frac{1}{20}$ *of* 60720) 640090 (10 Pounds.
60720

gives 3036) 32890 (10 Shillings.
$\frac{1}{12}$ *of which* 3036

gives 253) 2530 (10 Pence.
253

00

For *Proof*. If you would multiply the *Diviſor* by the *Quotient*, you muſt reduce each *Sum* into its *Fraction*, tho' it is not neceſſary to bring them into the ſame *Denomination*, as we have already ſaid ſeveral times in *Multiplication* of *Fractions*.

After you have made two great *Fractions* of theſe two *Sums*, you muſt *multiply* the two *Uppermoſts* by each other; and *divide* that Product by the Product of the two *Undermoſts multiplied* together alſo; which ſhews the 27 *Pounds* 15 *Shillings* 7 $\frac{29}{48}$ *Pence*, that were *divided*.

Opera-

Operation.

10 *l.* 10 *s.* 10 *d.* amount to 2530 *Pence*, which are $\frac{2530}{240}$ of a *Pound:* And 2 *l.* 12 *s.* 8½ *d.* amount to $\frac{1265}{2}$ of a *Penny*, which, multiplied by $\frac{2530}{240}$, produce 3200450, to be divided by 480.

Uppermoſts	1265	*Undermoſts*	2
	2530		240
	37950		480 *Diviſor.*
	6325		
	2530		
	3200450 *Sum* to be divided.		

Then *divide.*

Divr. *Dividend.* *Quotient.*

480) 3200450 (6667 $\frac{29}{48}$ of a *Penny*; the 12. of wch

288 is 555 . 5 *s.* 7 $\frac{29}{48}$. *d.*

320 27 *l.* 15 *s.* 7 $\frac{29}{48}$. *d.*

288

324

288

365

336

29

You never meet with any *Multiplications* more difficult than theſe; yet you ſee they become eaſy by *this Method.*

Another

Another Example of Multiplication.

To multiply 7 Pounds 7 Shillings 7 Pence, *by* 7 Pounds 7 Shillings 7 Pence:

BRING both theſe *Sums* into *Pence*, which are each 1771 *Pence*; and then you have $\frac{1771}{240}$, to be multiplied by $\frac{1771}{240}$, which are ſet down as follows:

```
        1771 . . . .  240 ths.
        1771 . . . .  240 ths.
      ------------------------
        1771 . . . .  96
      12397. . . . .
     12397.. . . . . .48.
     1771... . . . .
      ------------------------
Dividend 3136441  Diviſor   57600
```

$\frac{1}{20}$ *of* 57600) 3136441 (54 *l.*
288000

256441
230400

gives 2880) 26041 (9 Shillings
25920

$\frac{1}{12}$ *of which is* 240) 121 (0 $\frac{121}{240}$ Penny.

If you *divide* the 3136441 above, by 240 *Pence*, the *Quotient* will be *Pence*; which you may bring into *Shillings*, and afterwards into *Pounds*.

Example.

24|0) 31364|41 (13068 $\frac{121}{240}$ Pence.
24
73
72
164
144
204
192
121

108.9 Shil. 0 $\frac{121}{240}$ *of a* Penny.

54 *l.* 9 *s.* 0. $\frac{121}{240}$ *of a* Penny.

The *Proof* is eaſy: If you work it ſeparately, you muſt obſerve what has been ſaid above. Thus turning the Product of the *Multiplication*, which is 54 *Pounds* 9 *Shillings* 0 *Pence*, but $\frac{121}{240}$ of a *Penny*, all into 240*ths*, you will find again the 3136441, which did produce them: Alſo turning the 7 *Pounds* 7 *Shillings* 7 *Pence*, all into *Pence*, they are as before 1771 *Pence*; which you have no Occaſion to give yourſelf the Trouble to ſet down, ſince they are here already. So then all you have now to do, is to *divide* 3136441 by 1771, which gives in the *Quotient* 1771 *Pence*, equal to 7 *Pounds* 7 *Shillings* 7 *Pence*; which is the *Proof*.

Operation.

```
1771 ) 3136441 ( 1771 Pence.
       1771      ----------
       ----      14. 7 s. 7 d.
       13654     -------------
       12397     7 l. 7 s. 7 d.
       -----     -------------
        12574
        12397
        -----
          1771
          1771
          ----
             0
```

Having the Price of 1; *to know what* 100 *come to.*

Example. If a *Piece* of Cloth coſt 45 *Shillings*; what will 100 *Pieces* coſt? *Anſw.* 225 Pounds.

Explanation. 100 Pieces at 45 *Shillings*, is the ſame as 45 Pieces at 100 *Shillings*; that is to ſay, 4500 *Shillings*, or 225 *Pounds*. Now ſince 5 *Pounds* are equal to 100 *Shillings*, and ſhould produce the ſame Sum, you need only multiply 45 by 5 *Pounds*; which gives 225 *Pounds*, the Value of 100 Pieces at 45 *Shillings per* Piece; or of 45 Pieces at 5 *Pounds*, which are equal to 100 *Shillings*: For if you multiply 45 *Shillings* by 100 Pieces, or 100 Pieces by 45 *Shillings*, it will produce only *Shillings*; but if you multiply 45 *Shillings* by the 20*th* Part of 100 Pieces, which is 5, the *Product* will be *Pounds*.

Thus you ſee the Reaſons of the *Abbreviation* of this *Rule*, in which you may always multiply the *Shillings* by 5, which is the *20th* Part of 100, and it gives the *Anſwer* in *Pounds* at once.: If there be any *Pence* following the *Shillings*, you take for them (as the *Aliquot* Part of 12 *Pence*) out of the 5 *Pounds*; and if there be any *Pounds* before the *Shillings*, bring them down, and ſet them before the *Product* of the *Shillings*, which *Product* muſt conſiſt of but two *Figures*.

Example.

If 1 Tun *of* Oil coſt 52 *l.* 18 *s.* 3 *d.* *what coſt* 100?
Multiply the 18 *s.* by 5, the *20th* of 100.

bring down the 52 *l.* gives 5290 *l.*
for 3 *d.* the $\frac{1}{4}$ of 5 *l.* is 1 *l.* 5 *s.*

And the whole is 5291 *l.* 5 *s.* the *Anſwer.*

Another Way. If for the *Shillings* and Parts of a *Shilling*, which 1 Piece coſts, you ſet down ſo many *Pounds* and Parts of a *Pound*, and multiply them by 5, you will have the Value of 100.

Example. At 6 *s.* 6 *d.* apiece; what coſt 100? Inſtead of 6 *Shillings* 6 *Pence*, ſet down 6 *Pounds* 10 *Shillings*, and multiply them by 5, produces 32 *Pounds* 10 *Shillings*, the *Anſwer*.

There are other Ways of *abbreviating* this *Rule*, but they are neither ſo neat, nor ſo eaſy to remember, as theſe; wherefore we ſhall take no Notice of them.

Having the Price 100 *coſt; to know what* 1 *coſts; which is the Reverſe of the preceding Rule.*

IF 100 Pieces come to	2	28 *l.*; *what coſt* 1 Piece?
		20 *Shil.*
	5	60 *Shil.*
Anſ. 2 *l.* 5 *s.* 7 *d.* $\frac{20}{100}$,		12 *Pence.*
or $\frac{1}{5}$ of a *Penny.*	7	20

Explanation. The *Diviſor* 100, is only an *Unit*, and 2 *Cyphers* after it; wherefore cut off only the *two firſt Figures* to the *Right-hand* of the 228 *Pounds*, and the 2 which is before the *Separation* you muſt count 2 *Pounds:* Afterwards reduce the 28 *Pounds* that remain, into 560 *Shillings*, which are alſo divided by 100, in cutting off the *two Figures* 60, which is the Remainder of the Diviſion, and the 5 before the *Separation* is the *Quotient.* After which you muſt bring the 60 *Shillings* that remain, into 720 *Pence*; which divided by 100, in cutting off the two firſt *Figures*, ſhews 7 *Pence*, and 20 the *Remainder*.

INSTEAD of multiplying the 28 *Pounds* that remain, by 20 *Shillings*, only take the 20th Part of 100, which is 5, for a *Diviſor*, inſtead of 100; and by this means, the 28 that remained, become 28 *Shillings*, the 5*th* Part of which is 5 *Shillings*, and 3 *Shillings* over, which are 36 *Pence*, the 5th Part of which is 7 *Pence*, and $\frac{1}{5}$ of a *Penny*.

THE Reaſon of this *Abbreviation* is clear, and eaſy to be conceived; for diminiſhing or dividing the *Diviſor* itſelf by 20, and not meddling with what remains to be divided, is the ſame Thing, as if you *inlarged* or *multiplied* the ſaid *Remainder* by 20, without meddling with the *Diviſor*.

Another Way. If you take the 10*th* of the 10*th*, you will have the Value of *One:* And if there be any *Remainder* after the firſt 10*th*, it muſt be one of the 9 *Digits*, which is to be kept to be the *Unit Figure* in the *Uppermoſt* of the *Fraction*, which may ariſe in taking the laſt 10*th*; and the *Remainder* of this laſt 10*th* will be the *Tens* in the *Uppermoſt* of a *Fraction*, whoſe *Undermoſt* will be 100.

Example.

	l.	*s.*	*d.*	
If 100 be worth	249 :	15 :	5	*How much* 1.?
The 10*th* Part is	24 :	19 :	6 $\frac{5}{10}$.	
Of which the *Tenth* is	2 :	9 :	11 $\frac{45}{100}$, or $\frac{9}{20}$.	

Otherwiſe. If for the *Pounds*, and Parts of a *Pound*, which 100 Pieces are worth, you ſet down ſo many *Shillings* and Parts of a *Shilling*, and take the *Fifth* Part thereof, you will have the Value of 1 Piece in *Shillings*.

Thus in the laſt *Example*,
for 249 *l.* 15 *s.* 5 *d.*

I write 249 *s.* 9 *d.* $\frac{5}{20}$.

The *Fifth* is 49 *s.* 11 *d.* $\frac{45}{100}$ or $\frac{9}{20}$.

Having the Price of 1; *To know what* 1000 *come to.*

	l. *s.* *d.*	
If 1 *Tun* of Wine coſt	24 : 10 : 6	*what coſt* 1000?
Multiply the 10 *s.* by . .	50 *l.*	which make 1000 *s.*
gives 500 *l.* before which	———	bring down
the 24 *l.* is	24.500 *l.*	Afterwards for 6 *d.*
the *Half* of 50 *l.* is	25 *l.*	
And the whole will be	24525 *l.*	the *Anſwer.*

1000 *Tun* of Wine at 10 *Shillings*; or 10 *Tun* at 1000 *Shillings*, or 50 *Pounds* apiece, give the ſame Number of *Pounds*; for 50 is the 20*th* Part of 1000.

Another Example.

	l. *s.* *d.*	
If 1 *Tun* coſt	117 : 1 : 9½	*what coſt* 1000?
Multiply 1 *s.* by	50 *l.*	
which makes	050 *l.*	and bringing down
117, You have	117050 *l.*	then for 6 *d.*
the *Half* of 50 *l.* is	25 *l.*	and for 3 *d.*
the *Half* of 25 *l.* is	12 *l.* 10 *s.*	and for ½ *d.*
the *Sixth* of 12 *l.* 10 *s.* is	2 *l.* 1 *s.* 8 *d.*	
Anſwer.	117089 *l.* 11 *s.* 8 *d.*	

I ſet 0 before 50 *l.* in the third Line, that there might be three Places after the 117 to make it 117000, otherwiſe it would have been only 11700.

Having the Price of 1000, *to know what* 1 *coſts*?

Exam. If 1000 coſt 24|525 *Pounds*; *how much* 1?
|20 *Shillings.*
Anſw. 24 *l.* 10 *s.* 6 *d.* 10|500
|12 *Pence.*
6|000

Here you muſt work as before, when you had the Price of an ***Hundred***; only inſtead of cutting off ***two Figures***, you muſt here cut off ***three Figures***, becauſe there are 3 ***Cyphers*** in 1000.

Instead of multiplying the 525 ***Pounds*** on the ***Right-hand*** of the Separation, by 20 ***Shillings***, you may omit that, and ***divide*** them by the 20*th* Part of 1000, which is 50, and it will give in like Manner, 10 ***Shillings* 6 *Pence***, to be join'd to the 24 ***Pounds***.

Having the Price *of* 100, *to know what* 1000 *come to.*

l. *s.* *d.*
Exam. If 100 be worth 2 : 10 : 6 *How much* 1000?
Multiply by . . . . . 10 the *Rem.* of 1000.

gives 25 *l.* 5 *s.* the *Anſwer.*

Having the Price of 1000; *to know what* 100 *come to.*

Exam. If 1000 be worth 25 *l.* 5 *s. how much* 100? *Divide* by 10; the *Remainder* of 1000, and you will have 2 *l.* 10 *s.* 6 *d.* the *Anſwer.*

THESE Sorts of *Queſtions* being ſo eaſy, it is needleſs to give you any more *Examples.*

A ſhort Method for all Sorts of Multiplication, where there are but two Figures in one of the two Sums.

Example. By 44 ½ *multiply* 125 *l.* 17 *s.* 11 *d.*

Multiplying

125 *l.* 17 *s.* 11 *d.* by 6, produces	755 *l.* 7 *s.* 6 *d.*
755 *l.* 7 *s.* 6 *d.* by 7, gives	5287 *l.* 12 *s.* 6 *d.*
125 *l.* 17 *s.* 11 *d.* by 2, gives	251 *l.* 15 *s.* 10 *d.*
for ½, the ½ of 125 *l.* 17 *s.* 11 *d.* is	62 *l.* 18 *s.* 11 ½ *d.*
125 *l.* 17 *s.* 11 *d.* by 44 ½ prod.	5602 *l.* 7 *s.* 3 ½ *d.*

Explanation.

KNOWING that 6 times 7 is 42; we count the 125 *Pounds* 17 *Shillings* 11 *Pence*, 6 times, in multiplying it by 6; afterwards, this Sum, which is 6 times as large as 125 *Pounds* 17 *Shillings* 11 *Pence*, is ſtill made 7 times as big in multiplying it by 7, which gives 5287 *Pounds* 12 *Shillings* 6 *Pence*; which is of equal Value to 125 *Pounds* 17 *Shillings* 11 *Pence* counted up 42 times, or multiplied by 42, which is the ſame thing. Having then already counted up the 125 *Pounds* 17 *Shillings* 11 *Pence*, 42 times, it remains ſtill to be added, *twice* and a *Half* more; thus you reckon the *twice* in doubling, or multiplying them by 2, and for ½ you take the *Half* of the firſt Sum: Then adding up the three laſt Lines, or Products together, you have the *Total*, as in the *Example*.

OTHERWISE you might have multiplied the 125 *Pounds* 17 *Shillings* 11 *Pence*, by 9; and the Product 1133 *Pounds* 1 *Shilling* 3 *Pence*, by 5 (becauſe 5 times 9, or 9 times 5, is 45); and from the Product 5665 *Pounds* 6 *Shillings* 3 *Pence*, take 62 *Pounds* 18 *Shillings* 11 ½ *Pence*, leaves 5602 *Pounds* 7 *Shillings* 3 ½ *Pence*, for the whole Product, or *Anſwer*.

THIS *Example* is ſufficient for all Sorts of *Multiplication*, where one of the Sums has but *two Figures*; but when there are three of them it is rather too difficult, unleſs you are very well vers'd in the *Multiplication Table*.

FOR *Example*; if you were to *multiply* by 144, which is equal to 12 times 12; you might *multiply* the Sum by 12 at once, and that *Product* by 12 more at once, and this laſt *Product* will be the *Total Product*: And if you were to *multiply* by 147, or by 148, you might do as above, and add to it 3 or 4 times the Sum given to be *multiplied*, &c.

ON the contrary; to *divide* by 144, you need only take the 12*th* of the 12*th*. If you *divide* by 81, then take the 9*th* of the 9*th*; and in like manner for all other *Numbers*, which may be produced by two *Figures* multiplied together, as by 5 times 6, which produce 30, *&c.* This may convince you of the Advantage of being well acquainted with the large *Mul-*

tiplication Table, continued in Order as far as 200, which ought not to be thought too hard a Task for any young Perſon of a tolerable Memory, ſince by this Means one may anſwer with Eaſe and Expedition, ſeveral Sums, which after the common Way are very difficult.

A Way to divide Pounds Shillings and Pence, by Pounds Shillings and Pence, without reducing the two Sums, or multiplying the Remainders by 20 *Shillings, or* 12 *Pence; whereby are produc'd in one ſingle Line, Pounds Shillings and Pence.*

Example.

It is required to *divide* 164785 *Pounds* 16 *Shillings* 8 *Pence*, by 15 *Pounds* 5 *Shillings* 4 *Pence*.

The

The Operation.

	Diviſors. Pounds	Sh.	Pen.
for X. *Thouſ.*	152666	13	4
for *Thouſands*	15266	13	4
for *Hundreds*	1526	13	4
for *Tens*	152	13	4
for UNITS	15	5	4
for *Shillings*		15	$3\frac{1}{5}$
for *Pence*		1	$3\frac{4}{15}$

Dividend. Pounds	Shil.	Pen.
164785	16	8
152666	13	4
12119	3	4
10686	13	4
1432	10	0
1374	0	0
58	10	0
45	16	0
12	14	0
7	12	8
5	1	4
4	11	$7\frac{1}{5}$
	9	$8\frac{4}{5}$
	8	$10\frac{13}{15}$
		$9\frac{14}{15}$

Quotient.

Pounds	Sh.	Pen.
(10793	16	$7\frac{149}{229}$

Remr. $9\frac{14}{15}$ *d.* $= \frac{149}{15}$

Divr. $15\frac{4}{15}$ *d.* $= \frac{229}{15}$

Quotient is $\frac{149}{229}$ *d.*

EXPLANATION.

To do this *Sum*, and others of the like Sort, you need but take away each *Diviſor* from the Sum which it is to *divide*, as many times as it can be taken away after the common Way.

The *Sum* to be *divided* is 164785 *Pounds* 16 *Shillings* 8 *Pence*, and the *Diviſor* is 15 *Pounds* 5 *Shillings* 4 *Pence*, which being multiplied by 10 gives a *Diviſor*, that produces the *Tens* in the *Quotient*; and this laſt *Diviſor*, which has produc'd the *Tens* in the *Quotient*, is ſtill multiplied by 10, which gives another *Diviſor* to produce the *Hundreds*, which are *Tens* of *Tens*; thus you go on as long as it is neceſſary (always ſetting the *Greater Diviſors* above the *Leſſer*). Having found all the *Pounds* in the *Quotient*, you obſerve whether the *Remainder* is *Half* the *Diviſor* (which it is in this *Example*); if it be, ſubtract ½ the *Diviſor* from it, and ſet 10 *Shillings* in the *Quotient*, which is ½ *Pound*.

Then take one *Twentieth* of the *Diviſor*, or one *Tenth* of the ½ *Diviſor*, to make a new *Diviſor* to find the *Shillings* in the *Quotient*; and laſtly, one *Twelfth* of the *Diviſor* for *Shillings* will give a *Diviſor* for the *Pence*.

We think that now we have given *Examples* ſufficient, and have fully enough explain'd the *four Fundamental Rules* of *Arithmetick*, in *whole Numbers* and *Fractions*, as alſo in *Pounds Shillings* and *Pence*; ſo that thoſe who will give any Attention to what has been hitherto laid down, may eaſily anſwer all Sums in *Addition*, *Subtraction*, *Multiplication*, and *Diviſion*, however compound or difficult they may be.

THESE *four Fundamental Rules* are, as one may ſay, the *Whole* of *Arithmetick*; for all other *Rules* of different *Names*, as the *Rule of Three*, *Fellowſhip*, *Intereſt*, *Diſcount*, &c. are only the different Ways of applying, or making uſe of theſe *four Fundamental Rules*; the two firſt of which are indeed the Foundation of the two laſt, which are but an Abridgment of the former, as we have already ſaid, and prov'd in our *Tables*.

THUS all the *Science* of *Arithmetick* conſiſts, in knowing how to *increaſe*, which is effected by *Addition* and *Multiplication*; or elſe to *diminiſh*, which is perform'd by *Subtraction* and *Diviſion*; or in knowing how to do either as Occaſion requires, which is diſcoverable by good Senſe, and juſt Reaſoning; therefore it is in vain, and almoſt to no Purpoſe, to know theſe *four Fundamental Rules*, without ſuch a Share of good Senſe as may enable you to apply them in Buſineſs.

NOW, in order to apply them in Buſineſs on different Occaſions, you will ſtand more oblig'd, as we juſt now ſaid, to good Senſe, and ſome Exerciſe, than to any *Rule* whatever: Wherefore, he that has any *Queſtion* in *Arithmetick* to reſolve, ought well to weigh and examine all the *Words* and *Circumſtances* belonging to it, in order to ſee by what Means he may obtain a true *Anſwer*.

THE

RULE of THREE.

THIS *Rule* is thus called, becauſe it has three *Numbers* or *Sums*, which are alſo called its three *Terms*.

IT is alſo called, *The Rule of Proportion*, which is its true *Name*.

BUT, by Reaſon of its Excellency and Uſefulneſs, it is call'd *The Golden Rule*.

THERE are ſix Sorts hereof.

THE *Firſt* is, *The Simple Rule of Three Direct*, that is to ſay, which has but three *Terms*.

THE *Second* is, *The Double Rule of Three Direct*, conſiſting of Five, or more *Terms*; but which may be reduced to Three.

THE *Third* is *The Simple Rule of Three Inverſe*, having but three *Terms*.

THE *Fourth* is, *The Double Rule of Three Inverſe*, which has Five or more *Terms*; which may likewiſe be reduc'd to *Three*.

THE *Fifth* is compos'd, both of *Direct* and *Inverſe*.

AND the *Sixth* is call'd, *The Rule of Conjunction*, becauſe it joins ſeveral ſingle Sums together, and contracts all the particular *Operations* into one, which has only three Terms.

THUS every Sort hereof, whether *Direct* or *Inverſe*, *Simple* or *Double*, *Conjunct* or *Compound*, may be reduc'd to three *Terms*.

EVERY *Queſtion* in the *Simple Rule of Three Direct*, or reduc'd thereto, may be wrought after three different Ways to find the *Anſwer*, which is the fourth *Term* ſought for.

Firſt, By *multiplying* the two laſt *Terms* into one another, and *dividing* the Product by the firſt *Term*.

Secondly, By *dividing* the ſecond *Term* by the firſt, and *multiplying* its *Quotient* by the third or laſt *Term*.

Thirdly, By *dividing* the laſt *Term* by the firſt, and *multiplying* the *Quotient* thereof by the ſecond *Term*.

FROM hence you may take Notice, that the firſt *Term* always *divides* either the ſecond or third, or elſe their *Product*, when *multiplied* together.

The Simple Rule of Three Inverſe is exactly the contrary; for the third *Term* of that always *divides* one of the other two, or elſe their *Product*, being *multiplied* into one another.

ALL the *Terms* in the *Rule of Three*, (of what Sort ſoever it be) which ſhould produce the *Diviſor*, are *abbreviated* with all thoſe, which ſhould produce the *Dividend*, if capable of being *abbreviated*, after the ſame Manner, as the *Diviſor* and *Dividend* of any Sum, or the *Uppermoſt* and *Undermoſt* of a *Fraction*, are brought into leſs Terms. The firſt and laſt Term, in the *Simple Rule of Three Direct*, or *Inverſe*, ſhould denote the ſame Sort of Thing, that is to ſay, ſhould be both of the ſame *Name* or *Denomination*. The ſecond Term, and the *Anſwer*, ſhould alſo be of one *Denomination*. The following *Examples* will fully explain all that we have ſaid under this *Rule*.

Of the Simple Rule of Three Direct.

Firſt Example. If 3 *Ells* in all coſt 9 *Pounds*; *how much* will 6 *Ells* coſt at the ſame Price?

Multiply the two laſt *Terms* together, *viz.* 9 *Pounds* and 6 *Ells*, gives 54; which *divided* by the firſt *Term* 3, in taking the *Third*, produces 18 the *Anſwer*. The ſame Method is to be obſerved, when there are *Pounds Shillings* and *Pence* and *Fractions* of a *Penny*, belonging to any or all of the Terms. The Proof is found, in working back again by a contrary *Queſtion*, and ſaying;

IF 6 *Ells* coſt 18 *Pounds*; *how much* will 3 *Ells* coſt after the ſame Rate? Say; 3 times 18 is 54, the ſixth *Part* of which is 9, the *Anſwer*.

HENCE you ſee, according as we have ſaid, that the *firſt* and *laſt* Terms are both of the ſame *Name*, denoting *Ells*; and that the *ſecond* Term and the *Anſwer*, are both of the ſame *Denomination*, ſignifying *Pounds*.

Second Example.

If 4 *Ells* coſt . . . . . 9 *l.* 10 *s.* 6 *d.*
How much coſt 8 *Ells?* *multiply* by 8

Divide the *Product* . . . . . . 76 *l.* 4 *s.* by
4, the firſt *Term*, (which is done
by taking $\frac{1}{4}$,) and the *Anſwer* is 19 *l.* 1 *s.*

Proof. If 8 *Ells* coſt . . . . . 19 *l.* 1 *s.*
How much coſt 4 *Ells?*
Multiply the *Term* in the Middle by . . . 4 the
third *Term*,
gives . . . . 76 *l.* 4 *s.* to
be *divided* by 8, the firſt *Term*, and
the *Anſwer* is . . . . 9 *l.* 10 *s.* 6 *d.*

Here you may remark, that whatever Proportion there is, between the firſt and third *Term*, the ſame always is, and ought to be, between the ſecond *Term* and the *Anſwer:* That is to ſay, if the *firſt* Term be twice, three Times or four Times, as much as the *laſt*; the ſecond *Term* will be twice, three Times, or four Times, as much as the *Anſwer*. So if the firſt *Term* be but $\frac{1}{2}$, or $\frac{1}{3}$ or $\frac{1}{4}$ of the laſt; the ſecond *Term* will be but one *Half*, one *Third*, or one *Fourth* of the *Anſwer*. The ſame Proportion, that is between the two firſt *Terms*, muſt alſo be between the third or laſt *Term*, and the *Anſwer*.

Third

Third Example.

IF 12 *Ells* are worth 48 *l.* 16 *s.* 9 *d.* *How much* 5 $\frac{1}{3}$ *Ells?*

Say; 5 times 48 *l.* 16 *s.* 9 *d.* makes 244 *l.* 3 *s.* 9 *d.*
and the *third Part* of the ſaid *Sum* is 16 *l.* 5 *s.* 7 *d.*
Afterwards, adding theſe two
Products together, gives . . . 260 *l.* 9 *s.* 4 *d.*

to be *divided* by 12, the firſt
Term, which is done by taking
the $\frac{1}{12}$, which gives the *Anſwer*. 21 *l.* 14 *s.* 1 $\frac{1}{3}$ *d.*

Proof. If 5 $\frac{1}{3}$ *Ells* are worth 21 *l.* 14 *s.* 1 $\frac{1}{3}$ *d.*
How much 12 Ells?

Product . . . . 260 *l.* 9 *s.* 4 *d.* to
be *divided* by 5 $\frac{1}{3}$, the firſt *Term*:
The *Undermoſt* of the *Fraction* $\frac{1}{3}$ . . . 3

multiplied into 260 *l.* &c. is 781 *l.* 8 *s.* to be

divided by 16, which is done by taking
$\frac{1}{4}$ of the *Fourth*, which is 195 *l.* 7 *s.*

the *Fourth* of which is . . 48 *l.* 16 *s.* 9 *d.*
the *Anſwer.*

IN order to *divide* 260 *Pounds* 9 *Shillings* 4 *Pence*, by 5 $\frac{1}{3}$, you are oblig'd to *multiply* them by 3 the *Undermoſt* of the *Fraction* $\frac{16}{3}$; which gives 781 *Pounds* 8 *Shillings*, to be divided by 16.

Fourth Example.

If 12 $\frac{3}{4}$ *Ells* come to 25 *Pounds*; to *how much* come 3 $\frac{1}{3}$ *Ells?*

Anſwer. 6 *Pounds* 10 *Shillings* 8 *Pence*, $\frac{32}{51}$ of a *Penny.*

To perform this *Operation*, you muſt firſt of all turn the firſt and laſt *Term*, each into its *Fraction*, as if you were to *divide* them by one another; and then the *Queſtion* will ſtand thus: If 51 *Fourths* come to 25 *Pounds*; how much will 10 *Thirds* come to? But ſince the firſt and laſt *Terms* are not of the ſame *Denomination*, the one denoting *Fourths*, and the other *Thirds*, you muſt multiply the firſt *Term* 51, by 3 the *Undermoſt* of the *Fraction* in the laſt *Term* 3 $\frac{1}{3}$, which gives 153 for another firſt *Term*: Alſo, multiply the laſt *Term* 10, by the *Undermoſt* of the *Fraction* in the firſt *Term* 12 $\frac{3}{4}$, gives 40 for another laſt *Term*; and by this Means the *Sum* will ſtand without *Fractions* thus: If 153 *Ells* come to 25 *Pounds*; what do 40 *Ells* come to?

Operation:

	Ells.		*Pounds.*		*Ells.*
If	153	—	25	—	40

40

153) 1000 (6 *l.* 10 *s.* 8 $\frac{96}{153}$ *d.* or $\frac{32}{51}$.

918

Remain 82 *Pounds*,

or 1640 *Shillings.*

153

Remain 110 *Shillings*,

or 1320 *Pence.*

1224

96

Proof. If 40 *Ells* come to 6 *Pounds* 10 *Shillings* 8 *Pence*; to *how much* come 153 *Ells* ?

Anſwer. 24 Pounds 19 Shillings 9 Pence.

153 *Ells.*

6 *l.* 10 *s.* 8 *d.*

153 *l.* by 6 is	918 *l.*	for the 6 *l.*
$\frac{1}{2}$ of 153 *l.* is	76 *l.* 10 *s.*	for the 10 *s.*
of which $\frac{1}{15}$ is	5 *l.* 2 *s.*	for the 8 *d.*

40 { 8) 999 *l.* 12 *s.* to be divided by 40.

5) 124 *l.* 19 *s.*

24 *l.* 19 *s.* 9 $\frac{3}{5}$ *d.* *Anſwer.*

OBSERVE the Reaſon why 2 $\frac{2}{5}$ *Pence* is wanting in the *Proof*, is becauſe we took no Notice of the *Fraction* $\frac{32}{51}$ of a *Penny*, which we thought was ſuch a Trifle as not to be worth the while.

HITHERTO we have omitted no *Fractions*, that you might perfectly underſtand them, and be able to work any Sums that may have ſuch *Fractions*, which it is not always proper to overlook: But in order to know when they may be omitted, you ought perfectly to underſtand them, and know exactly well how they are to be wrought.

Fifth Example.

IF $\frac{2}{3}$ of an *Ell* coſts $\frac{4}{5}$ of a *Pound*; *How much* coſt $\frac{3}{4}$ of an *Ell?*

Anſwer. $\frac{9}{10}$ of a *Pound*, or 18 *Shillings.*

HERE you muſt, as always in the *Simple Rule of Three Direct*, *multiply* the two laſt *Terms* into one another, and *divide* their Product by the firſt, according to the Method of *Fractions*: Thus *multiplying* the *Undermoſt* of the firſt into the *Uppermoſts* of the two laſt, their *Product* will be the Sum to be *divided*, or the *Uppermoſt* of another *Fraction*. In like Manner *multiplying* the *Uppermoſt* of the firſt into the *Undermoſts* of the two laſt, their Product will be the *Diviſor*, or the *Undermoſt* of this other *Fraction*.

YOU ſee, that of the ſix *Numbers*, which form the three *Fractions* of the three *Terms*, there are three of them which produce the Dividend, and three which produce the *Diviſor*: But that you may be at no Loſs to remember which they be, that ſhould produce the

Dividend, and the *Diviſor*, you need but turn upſide down the *Fraction*, which is the firſt Term, ſetting *above* the Stroke the *Number* which was *below*, and putting *underneath* that which was *above*, in the following Manner: Thus inſtead of ſetting; If $\frac{2}{3}$, *&c.* ſet down;

If $\frac{3}{2}$. $\frac{4}{5}$ . . . . $\frac{3}{4}$ and the *Sum* will become eaſy by this little Alteration; for do but multiply all the *Uppermoſts* together, and you have the *Dividend*; and all the *Undermoſts* multiplied together give the *Diviſor*, as follows.

$$\left.\begin{array}{l}\text{3 times 4 is 12, and 12 times 3 is 36,}\\ \text{2 times 5 is 10, and 10 times 4 is 40,}\end{array}\right\}\text{ or } \frac{9}{10} \text{ w}^{\text{ch}}$$

are 18 Shillings the *Anſwer*.

OBSERVE, when the firſt *Term* is 1, or an *Unit*, the *Sum* is performed by a ſimple *Multiplication* of the two *laſt Terms* into one another; and when the *ſecond* or *third Term* is 1, it is done by a ſingle *Diviſion* of the *two other Terms* by one another; becauſe an *Unit* can neither *multiply* nor *divide*.

Examples.

If 6 gives 12; *How much* does 1 give? *Anſw.* 2.
If 6 gives 1; *How much* does 12 give? *Anſw.* 2.
If 1 gives 2; *How much* does 6 give? *Anſw.* 12.
If 1 gives 6; *How much* does 2 give? *Anſw.* 12.
If 12 gives 2; *How much* does 6 give? *Anſw.* 1.
If 2 gives 12; *How much* does 1 give? *Anſw.* 6.

HERE by the way, you may obſerve, that ſeveral *Queſtions* may be form'd, from one and the ſame *Sum*.

The Way of abbreviating the Rule of Three.

WE have already ſaid, that all Sorts of the *Rule of Three* are *abbreviated* after the ſame Manner as a *Fraction*; from whence it follows, that whatever ſhould produce the *Dividend*, is *abbreviated* with all that ſhould produce the *Diviſor*. Thus to *abbreviate* very much any *Sum* in the *Rule of Three Direct*, only *take*, if you can, the ſame Part out of the *firſt* and *ſecond Term*, or elſe out of the *firſt* and *third*, without any *Remainder*; and it is no Matter *what* Part you *take*, provided it be exact, and leaves no *Remainder*.

Firſt Example.

IF 12 *Ells* coſt 96 Pounds; what coſt 540 *Ells*? (*Abbreviator* $\frac{1}{12}$.)

THE $\frac{1}{12}$ of 12 is 1, and the $\frac{1}{12}$ of 96 is 8; and 8 times 540, is 4320 Pounds the *Anſwer*. The *Abbreviator* 12, which ſtands under the Word (*If*), denotes that you may *take* exactly the *Twelfth* out of 12, and 96, which being done, the *Sum* ſtands thus;

IF 1 . . . 8 . . . *How much* 540?
And by conſequence reduc'd to a ſingle *Multiplication* of 8 into 540.

Second

Second Example.

IF $\cancel{3}\cancel{0}\cancel{0}$ give $5\cancel{0}$; *How much* does $\cancel{9}\cancel{0}$ give?
$\frac{1}{3}$) 1 . . . . 5 3

Say, 5 times 3 is 15 the *Anſwer*. The two oo in the *firſt Term*, were *cancell'd* with the two oo in the *two other Terms*; and the *Remainder* of the *firſt Term*, which is 3, is *abbreviated* with the 9, that remains in the *third Term*, by *taking* the *Third*, as the *Abbreviator* denotes, which is under the Word (*If*): Afterwards, *multiply* 5 the *Remainder* of the *ſecond Term*, by 3 the *Remainder* of the *laſt*, gives 15 the *Anſwer*; for 1 which remains in the *firſt Term* does not *divide*.

Third Example.

IF $\cancel{9}$ *Bales* coſt 256 *l.* 12 *s.* 8 *d.* what coſt $\overset{4}{\cancel{3}\cancel{6}}$?
$\frac{1}{9}$) 1 . . . *multiply* by 4 the *Remainder* of the *laſt Term*.

Anſwer. 1026 *l.* 10 *s.* 8 *d.*

Proof.

IF $\cancel{3}\cancel{6}$ give 1026 *l.* 10 *s.* 8 *d.* what give $\cancel{9}$?

$\frac{1}{9}$) 4 *Diviſor.* 256 *l.* 12 *s.* 8 *d.* *Anſwer.*

Fourth

Fourth Example.

$4\frac{1}{3}$.

IF 9 *Pieces* of *Cloth* coſt 256 *l.* 12 *s.* 8 *d.* what coſt 39?

$\frac{1}{9}$) 1 . . . . $4\frac{1}{3}$ *Remainder* of

the *laſt Term.* 1026 *l.* 10 *s.* 8 *d.*

for $\frac{1}{3}$ . . . . 85 *l.* 10 *s.* $10\frac{2}{3}$ *d.*

the *Anſwer.* 1112 *l.* 1 *s.* $6\frac{2}{3}$ *d.*

Proof. IF 39 give 1112 *l.* 1 *s.* $6\frac{2}{3}$ *d.* what give 9? 1

$\frac{1}{9}$) $4\frac{1}{3}$ the $\frac{1}{13}$ of 3336 *l.* 4 *s.* 8 *d.*

is 256 *l.* 12 *s.* 8 *d.* the *Anſwer* of the *Proof.*

TO divide the *ſecond Term* by $4\frac{1}{3}$, the *Remainder* of the *firſt*, you muſt turn each *Sum* into its *Fraction*, by *multiplying* it by its *Undermoſt*, and adding its *Uppermoſt* thereto; which gives 3336 *Pounds* 4 *Shillings* 8 *Pence*, to be *divided* by 13 (*Thirds*); which is done at once by taking the *Thirteenth*, without working the *Diviſion* in Form.

Fifth Example.

IF ~~96~~ *Yards* coſt 65 *l.* 10 *s.* 6 *d.* what coſt ~~27~~ ?
$\frac{1}{24}$) 4. For $\frac{1}{8}$ 8 *l.* 3 *s.* 9 $\frac{6}{8}$ *d.* 1 $\frac{3}{24}$ or $\frac{1}{8}$

Take the $\frac{1}{4}$ of 73 *l.* 14 *s.* 3 $\frac{3}{4}$ *d.*

gives the *Anſwer* 18 *l.* 8 *s.* 6 $\frac{15}{16}$ *d.*

Proof. If ~~27~~ —— 18 *l.* 8 *s.* 7 *d.* How much ~~96~~ ?
Abbre. $\frac{1}{27}$) 1 3 $\frac{5}{9}$ 3 $\frac{5}{9}$

55 *l.* 5 *s.* 9 *d.*
for $\frac{1}{9}$ 2 *l.* 0 *s.* 11 $\frac{4}{9}$ *d.*
for $\frac{4}{9}$ 8 *l.* 3 *s.* 9 $\frac{7}{9}$ *d.*

65 *l.* 10 *s.* 6 *d.* and $\frac{2}{9}$ of a *Penny.*

THE $\frac{2}{9}$ over and above, proceeds from having ſet down 7 *Pence* inſtead of 6 $\frac{15}{16}$ *Pence*, which is a mere Trifle.

IF you perfectly underſtand all the Examples we gave in *Multiplication*, and *Diviſion* of *Pounds Shillings* and *Pence*, with the *Treatiſe of Fractions*, and have thoroughly got by Heart the *Tables* of *Multiplication* and *Diviſion*, you will find no Difficulty in working any *Queſtions* in the *Rule of Three.*

Of

Of the Rule of Three Inverſe.

THIS Rule is alſo called *Indirect* or *Reverſe*, becauſe it is wrought oppoſite to the *Direct*, and produces quite the contrary. In the *Rule of Three Direct*, *more* always requires *more*, and *leſs* always requires *leſs*, as may eaſily be obſerv'd in the foregoing *Examples*.

THE *Inverſe* being then the contrary to the *Direct*, *more* always in *this* requires *leſs*, and *leſs* always requires *more*; ſo by conſequence, the *laſt Term* muſt be the *Diviſor* of the *two firſt multiplied* together.

FROM whence you may obſerve, that there is nothing but Attention, with good Senſe, and ſome Practice, which will enable you to diſcover, when *more* ſhould produce *more* or *leſs*; or when *leſs*, ſhould produce *leſs* or *more*. In the *Rule of Three Inverſe*, the laſt *Term* being the *Diviſor* of the other two multiplied together, it may be *abbreviated* with them.

NOW, that you may eaſily comprehend this Rule, we ſhall begin by the ſmalleſt, and eaſieſt *Examples*, the largeſt and the moſt difficult being performed after the ſame Manner.

Firſt Example.

IF 1 *Man* (*firſt Term*) does a Piece of Work in 4 *Days* (*ſecond Term*); in how many *Days* would 2 *Men* (*third or laſt Term*) be doing the ſame?

IF 1 *Man* . . . 4 *Days* . . *How many* 2 *Men* ? Say; once 4 is but 4 *Days*, which *divided* by 2, or parted out to 2 *Men*, gives 2 *Days*, the *Anſwer*.

YOU ſee the *laſt Term* denoting *more Men* than the *firſt Term*, the *Anſwer* ſhews *leſs* Days than the *Term* in the *Middle* ; becauſe the more *Men* there are to do a Piece of Work, the *leſs Time* will be required ; and the *fewer Men* there be to do the ſame Piece of Work, the *longer Time* it muſt take up : In this Manner you muſt reaſon according to good Senſe, and the Nature of the Queſtion, to know if the *Sum* be in the *Rule of Three Direct*, or *Inverſe*.

Proof.

IF 2 *Men* . . are 2 *Days* . . *how long* 1 *Man* ? ſay ; twice 2 *Days* makes 4 *Days*, which *divided* by 1 *Man*, gives 4 *Days*, the *Anſwer*.

Second Example.

IF 1 Piece of Work be done in 4 *Days* by 1 *Man* ; *How many Men* would it require to do the ſame in 2 *Days* ?

IF 4 *Days* . . . 1 *Man* . . . *How many* 2 *Days* ? ſay ; 4 times 1 *Man* is 4 *Men*, which divided by 2 *Days*, gives 2 *Men*, the *Anſwer*.

Proof.

Proof.

IF this be done in 2 *Days* by 2 *Men*; by *how many* would it be done in 4 *Days*?

IF 2 *Days* . . . . . 2 *Men* . . . . . 4 *Days*?
ſay; twice 2 is 4, the *Fourth* of which, is 1 *Man*, the *Anſwer*.

YOU will do well to take good Notice of theſe little *Examples*, and their *Proofs*; and that you may not be miſtaken in diſtinguiſhing ſome *Queſtions* that are very large, and difficult to be known, by reaſon of the Irregularity of the *Sums*, which are the *Terms*, you may ſuppoſe the little *Numbers* above, *&c.*

Third Example.

IF 12 *Men* build a Wall in 24 *Days*; *How long* would 8 *Men* be about the ſame?

IF 12 *Men* . . ~~24~~ *Days* . . in *how many* ~~8~~ *Men*?
ſay; 12 times . . 3 is 36 *Days*. 1

Anſwer. In 36 *Days*.

THE *ſecond Term* 24, is *abbreviated* with the *laſt Term* 8, in taking the $\frac{1}{8}$ of each.

Proof.

IF 8 *Men* are 36 *Days* in building a Wall; *How long* would 12 *Men* be about the ſame?

If 8 *Men* . : 36 *Days* . . *How long* 12 *Men*?
8 *firſt Term.*

---

288 to be *divided* by 12 *laſt Term.*

$\frac{1}{12}$ of which is 24 *Days*, the *Anſwer.*

Fourth Example.

If in 24 *Days* a Wall be built by 12 *Men*; by *how many* would it be built in 36 *Days*?

If $\cancel{24}$ *Days* . . 12 *Men* . . in $\cancel{36}$ *Days.*
$\frac{1}{12}$) 2 times 12 is 24, 3 *Diviſor.*
the third of which is 8, the *Anſwer.*

Proof.

If in 36 *Days* this Wall be built by 8 *Men*; *How many* would it require to build it in 24 *Days*?

If in $\cancel{36}$ *Days* . . 8 *Men* . . in $\cancel{24}$ *Days*?

$\frac{1}{12}$) 3 times 8 is 24, the 2 *Diviſor*;

Half of which is 12, the *Anſwer.*

After having *abbreviated* the 36 with the 24, in taking the *Twelfth*; you may ſtill *abbreviate* the 2 that *remains* of the 24, with the *Term* in the Middle, in taking the $\frac{1}{2}$ of both the one and the other.

You ſee in every Example, that *more* requires *leſs*, and *leſs* requires *more*; that is to ſay, the *third Term* denoting *fewer* Things than the firſt, the *Anſwer* ſhews *more* of like Things, than the *Term* in the *Middle*, to which it always *anſwers*, if the *Sum* be well ſtated.

Fifth Example.

James having borrowed 40 *Pounds* of *Peter* for 3 *Months*, he deſires to know, *how long* he ought to lend him 60 *Pounds*, to ſatisfy him for that Kindneſs?

IF 40 Pounds . . 3 *Mo. how long* 60 Pounds?
Anſwer, 2 *Months*.

THE *Proof* is wrought according as we have ſhewn in the *Examples* above, that is to ſay, in ſetting the *Anſwer* in the Middle of another *inverſe Queſtion*, and placing the *laſt Term* in the *Queſtion*, at the *Beginning* in the *Proof*, and making the *firſt Term* in the *Queſtion*, the *laſt* in the *Proof*, which is to be obſerv'd in all Sorts of the *Rule of Three*, except in the *Rule of Conjunction*.

Sixth Example.

IF *James* borrowed of *Peter* 40 *Pounds* for 3 *Months*; how much ſhould *James* lend to *Peter* for 2 *Months*?

Anſwer, 60 *Pounds*.

IF 3 *Months* . 40 *Pounds* . . *how much* 2 *Months*?
3 times 20 *Pounds*, make 60 *Pounds*, the *Anſwer*.

Seventh Example.

IF 2 *Men* in 8 *Days* eat up a certain Quantity of Proviſion; *How long* would 4 *Men* be eating the ſame?

IF ~~2~~ *Men* . . in ~~8~~ *Days*, *How long* ~~4~~ *Men?*
$\frac{1}{2}$) *Anſwer.* In 4 *Days.* ~~2~~ *Diviſ.*

Eighth Example.

IF in 9 *Days* 6 *Men* eat up a Quantity of Proviſion; *How many Men* would eat up the ſame in 3 *Days?*

IF in ~~9~~ *Days* . . 6 *Men* : . in ~~3~~ *Days?*
$\frac{1}{3}$) 3 times 6 is 18 *Men*, the *Anſwer.*

Ninth Example.

IF when *Wheat* is 30 *Shillings* the Load, the Penny Loaf weighs 4 *Ounces*; *How much* ſhould it weigh, when *Wheat* is but 12 *Shillings* per *Load?*

THE cheaper the *Wheat* is, the more *Bread* you'll have for the ſame Money.

Operation.

IF $\cancel{3}\cancel{0}$ *Shillings* .. $\cancel{4}$ *Ounces* .. *how much* .. $\cancel{1}\,\cancel{2}$ *Shil.* ?
$\frac{1}{3}$) 10 *Ounces* of Bread, the *Anſwer.* $\cancel{4}$

Tenth Example.

IF you have 4 *Ounces* of Bread at any certain Price, when *Wheat* is 30 *Shillings* the *Load*; *How much* ſhould the *Load* coſt, when for the ſame Money you have 10 *Ounces* of Bread?

Operation.

IF 4 *Ounces* of Bread . . 3$\cancel{0}$ *Shillings* . . 1$\cancel{0}$ *Oz* ?
4 times 3 is 12, the *Anſwer.*

Eleventh Example.

IF 6 *El's* of $\frac{3}{4}$ wide be neceſſary to make a Gown; *How many Ells* of $\frac{2}{3}$ wide muſt there be to line it? *Anſwer*, 6 $\frac{3}{4}$ *Ells* of that of two *Thirds* wide.

Operation.

IF of $\frac{3}{4}$ wide it is neceſſary to have 6 *Ells*; *How many* muſt there be of $\frac{2}{3}$ wide?

THE eaſieſt Way of working this *Queſtion*, is to put an *Unit* under the *middle Term*, in this manner, ($\frac{6}{1}$) Then turning the *Fraction*, which is the *laſt Term*, upſide down, it ſtands thus:

IF of $\frac{3}{4}$ . . . $\frac{6}{1}$ . . . *How many* of $\frac{3}{2}$?

AFTERWARDS, *multiply* the *three Uppermoſt's* together, which makes 54, to be *divided* by the *three Undermoſts* alſo *multiplied* together, which is 8; whereby you'll have the *Anſwer* in the *Quotient*.

$$\frac{3}{4}\text{ times }\frac{6}{1}\text{ is }\frac{18}{4}\text{, and }\frac{18}{4}\text{ times }\frac{3}{2}\text{ is }\frac{54}{8}\text{, }\left\{\begin{array}{l}6\textit{ Ells }\frac{6}{8}\\ \\ \quad\text{or }\frac{3}{4}\text{.}\end{array}\right.$$

the *Anſwer.*

Twelfth Example.

IF 6 *Ells* are of $\frac{3}{4}$ wide; how wide muſt the Lineing be that is 6 $\frac{3}{4}$ *Ells* (or $\frac{27}{4}$?)

IF $\frac{6}{1}$ have $\frac{3}{4}$, *how much* $\frac{4}{27}$? *Anſwer*. The Lineing will be $\frac{2}{3}$ wide. We turn'd the *laſt Term* $\frac{27}{4}$ upſide down, and ſet down $\frac{4}{27}$.

Thirteenth Example.

IF the *Intereſt* of a *Sum* for a certain Time, after the Rate of the 20*th Penny*, amounts to 500 *Pounds*, what will the *Intereſt* of the ſame *Sum* for the like Time come to, after the Rate of the 25*th Penny*? *Anſwer*, 400 *Pounds*.

THE *greater* the *Denomination* of the *Penny* is, the *leſs Intereſt* it produces; now the 25*th Penny* being a *greater Denomination* than the 20*th Penny*, the *Intereſt* conſequently will be *leſs*; for if you let out 100 *Pounds* for one Year after the Rate of the 20*th Penny*, you will have 5 *Pounds Intereſt*; whereas after the Rate of the 25*th Penny*, the *Intereſt* will be but 4 *Pounds*: Therefore this *Queſtion* is wrought by the *Rule of Three Inverſe*.

Operation.

IF the 20*th Pen.* gives 500 *l.* what will the 25*th Pen.*?
⅕) 4 4 *Diviſor* 5
2000 *Pounds*, the ⅕ of which is 400 *Pounds*, the *Anſwer*.

For the better underſtanding what follows, about the 20th Penny, *or* 25th Penny, &c. *which is the Manner of ſtating the Rate of* Intereſt *in* France, *and ſome other Countries*; *the Learner is deſired to take* Notice, *that it ſignifies* 1 *for the* Intereſt *of* 20, *or* 1 *for the* Intereſt *of* 25, &c. *be they* Pounds, Shillings, *or* Pence; *ſo that the* 20th Penny *ſignifies* 5 per Cent. *there being* 5 *times* 20 *in* 100; *and the* 25th Penny *ſignifies* 4 per Cent. *becauſe* 4 *times* 25 *makes* 100, *which you'll find explain'd further on.*

Fourteenth Example.

IF 500 *Pounds* be the *Intereſt* ariſing from a *Sum* for a certain Time, after the Rate of the 20*th Penny*; After what Rate will 400 *Pounds* be the *Intereſt* of the ſame *Sum* during the like Time?

IF 500 *l.* . . . . 20*th Penny* . . . . . 400 *l.*
$\frac{1}{4}$) 5 times . . . 5 makes the 25*th Penny*, the *Anſwer.*

OTHERWISE, theſe Sums may be wrought by the *Rule of Three Direct*, by turning the Rates of *Intereſt* into a *Fraction*, and afterwards bringing them into the ſame *Denomination*, in order to make the Tranſpoſition.

Example.

IF $\frac{1}{20}$ produces 500 *Pounds*; *How much* $\frac{1}{25}$?

Multiplying the *Uppermoſt* of each *Fraction* by the *Undermoſt* of the *other*, brings them into the ſame *Denomination*; and inſtead of $\frac{1}{20}$, and $\frac{1}{25}$, they will be $\frac{25}{500}$, and $\frac{20}{500}$; but ſince you have nothing to do with the *Denomination*, (500*ths*) you may take only the *Uppermoſts*, and ſay;

IF 25 gives 500 *Pounds*, *How much* will 20? *Anſwer*, 400 *Pounds*.

YOU ſee here, that if you would work ſuch like *Queſtions* by the *Rule of Three Direct*, you need only ſet the *firſt* Term *laſt*, and the *laſt* Term firſt, which is founded upon Reaſon, as we have juſt now demonſtrated : And tho' the *Sum* conſiſted of 7 *Terms*, it would be brought to be all *Direct*, by only tranſpoſing the two *Rates of Intereſt*.

Example.

IF 100 *l.* at the 20*th Penny*, in 2 *Years*, produce 10 *Pounds*; *How much* will 300 *l.* at the 30*th Penny*, in 6 *Years*?

Tranſpoſition.

IF 100 *Pounds* at the 30*th Penny* in 2 Years produce 10 *Pounds*; *How much* will 300 *Pounds* at the 20*th Penny* in 6 *Years*?

Anſwer. 60 *Pounds.* But this you will underſtand better afterwards.

Of the Double Rule of Three Direct, or the Rule of Three compoſed of five Terms.

IF 4 *Men* in 2 *Days* { Gain 8 *l.*; } *How much* 8 *Men* in . . . . 4 *Days*?

Anſwer. 32 *l.*

THIS *Double Rule of Three* is performed by two *Single Rules of Three Direct*; for the more *Men* and *Days* there are in the further End, the more *Pounds* there will be in the *Anſwer*. This may be done at *two Statings*, in making the *Anſwer* of the *Firſt* the *Middlemoſt* of the *Second*, thereby to obtain the true *Anſwer* to *all* the *Queſtion*.

Firſt Single Queſtion.

IF 4 *Men* gain 8 *l.* How much will 8 *Men* gain?

$\frac{1}{4}$) 2 times .... 8 is 16, the *Middlemoſt* of the *laſt* ſingle *Queſtion*.

Second Single Queſtion.

IF in 2 *Days* they gain 16 *l.* how much in 4 *Days*?

$\frac{1}{2}$) 16 times .... 2 is 32 *Pounds*, the *Anſwer*.

THUS you may work ſeparately all *Queſtions* in the *Rule of Three*, where there are 5 or more Terms: But as this Way is too long when the *Sum* is intirely *Direct*, you may work it all at one *Stating*; *multiplying* all the *Terms* of the *firſt Part* for a *Diviſor*, to the *Product* of *all* the *Terms* of the *laſt Part multiplied* into the *Middlemoſt*.

NOW ſince the *Product* of the *Terms* of the *firſt Part*, is the *Diviſor* of the *Product* of *all* the other *Terms*, they may then be *abbreviated* with *all the others*, that is to ſay, thoſe of the *firſt Part*, with *all the others* which follow.

THUS in the *Example* above, the *two* Terms of the *firſt Part multiplied* together make 8, which is *abbreviated* with the 8 in the *Middle*, and there is nothing more remains than the *two* Terms of the *further* End, which *multiplied* together produce the *Anſwer*, 32 *Pounds*.

Proof.

IF 8 *Men* in 4 *Days* } have gain'd 32 *l.* }; how much 4 *Men*, in . . . . 2 *Days*?

IF 32 . . have gain'd 32 *Pounds*; how much 8?
Anſwer. 8 *Pounds.*

OBSERVE here, that the *two Products* of the *two Ends* with the *Middle*, have reduc'd the *double* Poſition to a *ſingle* Poſition of three *Terms*, which are 32, 32, and 8.

Second Example.

SUPPOSE when a *Tun* of Wine coſts 144 *Pounds*; you may have 2 *Pints* for 20 *Pence*; how much in Proportion would 6 *Pints coſt*, if the *Tun* was worth but 72 *Pounds*?
Anſwer. They would coſt 30 *Pence.*

THE *cheaper* the Wine is, the *leſs* it coſts *per Pint*; and the *more* the *Tun* coſts, the *dearer* the *Pint* is: Therefore the *two ſingle* Poſitions which form this *double one*, are both *Direct*.

SUM.

If at 144 *l.* the *Tun* } 20 *d.* { at 72 *l.* the *Tun*,
2 *Pints* coſt } { 6 . . *Pints* ?

288 *Diviſor.*

432
20 *Pence.*

Then divide 8640 *Dividend.*

288) 8640 (30 *Pence*, the *Anſwer*.
864

0

Proof.

If at $\cancel{7}\cancel{2}$ *l.* the *Tun* } $\cancel{3}\cancel{0}$ *d.* { at $\cancel{1}\cancel{4}\cancel{4}$ *l.* the *Tun*
$\cancel{6}$ *Pints* coſt } { 2
5 2 . . *Pints* ?
4

Anſwer. 5 times 4 is 20 *Pence.*

Having taken $\frac{1}{6}$ of 6, and of 30, there *remain* 5 under the 30; and having taken the 72*d* of 72, and of 144, there *remain* 2 under the 144.

Third Example.

If when Wheat is 30 *Shillings* the *Load*, a Loaf of 4 *Ounces* coſts 3 *Pence*; when the Price of the *Load* is but 12 *Shillings*, how much will a Loaf of 9 *Ounces* coſt in Proportion?

THE *cheaper* the *Wheat* is, the *leſs* will 9 *Ounces* of *Bread* coſt; therefore this *Sum* is intirely *Direct*.

IF at 30*s*. the *Load* 4 Oz. of *Bread* } coſt 3 *Pen.* *how much* } at 12 *s*. the *Load* 9 Oz. of *Br.*

120 *Diviſor*

108
3 *Pence.*

120) 324 (2 $\frac{84}{120}$
240 *or* $\frac{7}{10}$
84

which is 2 *Farthings* $\frac{8}{0}$ of a *Farthing.*

Proof.

IF at $\cancel{1}\cancel{2}$ *s*. the *Load* 9 Oz. of *Bread* } coſt 2 $\frac{7}{10}$ *d.* *how much* } at 30 *s*. the *L.* 4 Oz. of *B.*?

10 $\cancel{1}\cancel{2}\cancel{0}$
$\frac{1}{9}$ of 27 *Div*^{d} 10
is 3 *Pence* the *Anſwer.*

AT the *further* End in the *Proof*, 4 times 30 is 120, the *twelfth* Part of which is 10, by which *multiply* the *Middlemoſt*, and *divide* the *Product* 27 by 9, the *laſt* Term of the *hither* End: The *firſt* Term 12 being already *abbreviated* with the 4 times 30, *&c.*

The Double Rule of Three intirely Inverſe.

THE *firſt* Part *multiplied* into the *middle Term* produces the *Dividend*, and the *Terms* in the *laſt* Part *multiplied* together, produce the *Diviſor*.

Firſt Example.

IF 50 *Maſons*, working 12 *Hours* in a Day, build an Houſe in 6 *Months*; *how long* wou'd 90 *Maſons* be about the ſame, working 15 *Hours* in a Day?

THE *more Maſons* there are, and the *more Hours* in a Day they work, the *leſs* Time will be required to build ſuch an Houſe; wherefore the *Queſtion* is intirely *Inverſe*.

Operation.

$$\text{IF}\ \left.\begin{matrix}50\ \textit{Maſons}\\ 12\ \textit{Hours}\end{matrix}\right\}\ \text{in 6}\ \textit{Mo. how long}\ \left\{\begin{matrix}90\ \textit{Maſons}\\ 15\ \textit{Hours?}\end{matrix}\right.$$

60 to be *multiplied*   135 *Diviſor.*

by 6 *Months*

360 to be *divided.*

$$135\ )\ \begin{array}{l}360\\ \underline{270}\\ 90\end{array}\ (\ 2\ \textit{Months}\ \tfrac{18}{27}\ \text{or}\ \tfrac{2}{3}\ \text{of a}\ \textit{Month}$$

which is 20 *Days*.

Proof.

Proof.

IF 90 *Maſons* } are 2$\frac{2}{3}$ *Mo. how long* { 50 *Maſons*
15 *Hours* } 9 *Remaind.* of 90 { 12 *Hours?*
4

3 Of 24, the *Fourth* is 6 *Months*, the *Anſwer*.

Second Example.

IF a certain Quantity of Proviſion ſerves 30 *Men* for 50 *Days*, with 25 *Ounces* each; *how much* muſt 90 *Men* have apiece, when they are oblig'd to make the ſame Proviſion ſerve 'em 60 *Days?*

THE *more Men* there are to ſhare this Proviſion amongſt, the *leſs* they muſt have apiece; and the *more Days* it is to ſerve them, the *leſs* they muſt have apiece: So that the two *ſingle Statings* which compoſe this *Queſtion* are both *Inverſe*.

IF 30 *Men* } have 25 *Ounces* { *how much* 90 *Men*
for 50 *Days* } { for 60 *Days?*

5 *Remainder* of 50 2

125 to be *divided* by 18 *Div.*

18) 125 (6$\frac{17}{18}$ *Ounces*, the *Anſwer*.
108

17

Proof.

IF 90 *Men* } have $6\frac{17}{18}$ *Ounces* { *how much* 30 *Men*
in $\cancel{6}0$ *Days* } { in 50 *Days?*
2 18

18 Of 125, the 5*th* is 25 Oz. the *Anſwer.*

Third Example.

IF 50 *Maſons* build an Houſe in 6 *Months*, working at it 12 *Hours* in a Day; *how many Hours* in a Day ſhould 90 *Maſons* work, that they may build the ſame in 2 *Months* 20 *Days?* *Anſwer.* 15 *Hours.*

3
IF 50 *Maſons* } $\cancel{1}\,\cancel{2}$ *Hours* } $\cancel{9}0$ *Maſons*
are $\cancel{6}$ *Months* } *how many* } 2 *M.* $\frac{2}{3}$ or 20 *Days?*
2 4

10 10 of the *hither* End,

40 to be *divided* by 2 $\frac{2}{3}$ in the *further* End.

3 *undermoſt* of the *Fraction.*

120 to be *divided* by 8, in taking the 8*th*, which gives 15 *Hours* in a Day, the *Anſwer.*

THE 2 and $\frac{2}{3}$ we brought all into *Thirds*, in order to *divide* the 120 *Thirds.*

Fourth

Fourth Example.

IF for 6 *Months*, working 12 *Hours* in a Day, there be requir'd 50 *Maſons* to build an Houſe; *how many Maſons* would it require to build the ſame in 2 *Months* 20 *Days*, working at it 15 *Hours* in a Day?

IF 6 *Months* } have $5\cancel{0}$ { *how many* $2\frac{2}{3}$ *Months*
with 12 *Hours* } *Maſons* { with 15 *Hours?*

$\cancel{7}\,\cancel{2}$ *abbreviated* with 4, the *Remainder* of $4\cancel{0}$.
18 times 5 *Maſons* is 90 *Maſons*, the *Anſwer*.
The 0 in the 40, was cut off with the 0 in the 50.

Fifth Example.

IF a certain Quantity of Bread ſerve 30 *Men* with 25 *Ounces* apiece, for 50 *Days*; *how long* may 90 *Men*, with the ſame Quantity, have $6\frac{17}{18}$ *Ounces* each?

IF $\cancel{3}\cancel{0}$ *Men* } 50 *Days*; *how many* { $\cancel{9}\cancel{0}$ *Men*
have 25 Oz. } { $6\frac{17}{18}$ Oz.?
50 the *middle Term* 3 *Re.* of 90.

1250 to be *divided* by . . . . $20\frac{15}{18}$ or $\frac{5}{6}$ }
6 *Undermoſt* of the *Fraction* $\frac{5}{6}$.

7500 *Sixths*, to be *divided* by 125 . . . . *6ths.*]
equal to $20\frac{5}{6}$.

125) 7500 (60 *Days*, the *Anſwer*.
750
00

Sixth Example.

If for 50 *Days* there be a Quantity of Bread allow'd, that furniſhes 25 *Ounces* apiece to 30 *Men*; to *how many* Men for 60 *Days*, would this ſame Proviſion furniſh out $6\frac{17}{18}$ *Ounces* each?

If 50 *Days* } to 30 *Men*; { 60 *Days*
25 *Ounces* } 5 { $6\frac{17}{18}$ *Ounces*?

125 — 125 18*ths Div.*
5 *Rem.* of the *Middle.*

625 *Dividend*
18 *Undermoſt* of the *Fraction* of the *further* End

5000
625.

11250 — 125) 11250 (90 Men, the *Anſwer.*
1125

00

The Double Rule of Three compoſ'd both of Direct and Inverſe.

Every *Queſtion* in this *Double Rule of Three*, contains *two ſingle Poſitions*, one of which is *Direct*, and the other *Inverſe*; and when the *Terms* are placed right in Order, the *three middlemoſt multiplied* together, produce the *Sum to be divided*; and the *firſt* and *laſt Terms multiplied* alſo together, produce the *Diviſor.*

Firſt

Firſt Example.

IF for 20 *Pence* you may have 2 *Pints* of Wine, when the *Tun* coſts 72 *Pounds*; *how much* in Proportion ſhould the *Tun* coſt, when for 30 *Pence* you may have 6 *Pints*?

TO place theſe *five Terms* in their *proper Order*, I conſider that the *more Pence* I pay for the ſame Quantity of Wine, the *more Pounds* the *Tun* muſt coſt; therefore *that Part* which regards the *Pence* is *Direct*: And conſequently I muſt *multiply* by the 30 *Pence*, and *divide* by the 20 *Pence*. But the *more Pints* I have for the ſame Money, the *fewer Pounds* muſt the *Tun* coſt; therefore *this Part* is *Inverſe*, and of Conſequence I muſt *multiply* by the 2 *Pints*, and *divide* by the 6 Pints. The *Queſtion* then may be conveniently ſtated in the following Order; where I *multiply* the *three middle* Terms together, and *divide* their *Product* by the *Product* of the *firſt* and *laſt* Terms.

The Order.

IF for 20 *Pence*,	2 *Pints* 72 *Pounds*; 30 *Pence*	6 *Pints*? 2

Anſwer. 36 *Pounds* the *Tun*.

HAVING *abbreviated* the *Middle* with the *two Ends*, there remain only 72 to be *divided* by 2, the *Remainder* of the *laſt Term*; which is done by taking the *Half*, and the *Anſwer* is 36 *Pounds*.

Second Example.

IF for 20 *Pence*, when the *Tun* coſts 72 *Pounds*, you have 2 *Pints* of Wine; *how many Pints* may you have in Proportion for 30 *Pence*, when the *Tun* coſts but 36 *Pounds*?

$$\text{If for } \cancel{2}\cancel{0}\ \textit{Pence,} \left\{ \begin{array}{l} 72\ \textit{Pounds} \\ \cancel{2}\ \textit{Pints;} \\ \cancel{3}\cancel{0}\ \textit{Pence} \end{array} \right\} \begin{array}{l} \cancel{3}\cancel{6}\ \textit{Pounds?} \\ 12 \end{array}$$

12) 72 (6 *Anſwer*. 6 *Pints* for 30 *Pence*.
72

0

THE *Middle* is *abbreviated* with the *two Ends*, and there remain only 72 in the *Middle*, to be *divided* by 12, the *Remainder* of the 36, the *laſt Term*, which gives the *Anſwer* as above.

Third Example.

If for 13 *Pence* you may have 8 *Pound* of *Bread*, when Wheat is 30 *Shillings* the *Load*; *How much* ſhould the *Load* coſt in Proportion, when for 11 *Pence* you may have 16 *Pound* of *Bread?*

13 *Pence* } ~~8~~ *Pound* of *Bread* { ~~16~~ P^{nd} of *Bread?*
~~30~~ *Shillings*; ~~2~~
15
11 *Pence.*

165, to be *divided* by 13, the 1ſt Term.

13) 165 (12 *s.* 8 $\frac{4}{13}$ *d.*
13

35
26

9 *Shil.*
or 108 *Pence*
104

4

The 8 in the *Middle* is *abbreviated* with the *further End*, in taking the *Eighth*, and there *remain* 2 of the *laſt* Term.

Then *abbreviating* the 30 in the *Middle* with the 2, that *remain* in the *further End*, leaves 11, and 15 in the *Middle*, which *multiplied* together produce 165, to be *divided* by 13, the *firſt* Term, which gives

$12\frac{2}{13}$ *Shillings*, or 12 *Shillings* 8 *Pence* $1\frac{4}{13}$ *Farthing*, the *Anſwer*.

EVERY *Queſtion* in the *Rule of Three* may be chang'd and diverſified as *many different Ways*, as there are *Terms*, including the *Anſwer*; and as there are *ſix* of them in the *Double Rule of Three*, ſo every *Queſtion* may be chang'd *ſix* ſeveral *Ways*.

Example.

1 Comp. of *Direct*, and *Inverſe*.

IF for 13 *Pence* you may have 8 *Pound* of Bread, when Wheat is 30 *Shillings* the *Load*; *how much* ſhould the *Load* coſt, when for 11 *Pence* you may have 16 *Pound* of Bread?

Anſwer. $12\frac{2}{13}$ *Shillings.* See *page* 217.

2 Comp. of *Direct*, and *Inverſe*.

IF for 11 *Pence* you have 16 *Pound* of Bread, when the *Load* of Wheat is worth $12\frac{2}{13}$ *Shillings*; *how much* is the *Load* worth, when for 13 *Pence* you have 8 *Pound* of Bread?

Anſwer. 30 *Shillings.* See *page* 215.

3 Comp. of *Direct*, and *Inverſe*.

IF when the *Load* is worth 30 *Shillings*, you have 8 *Pound* of Bread for 13 *Pence*; *how much* ſhall you have for 11 *Pence*, when it is but $12\frac{2}{13}$ *Shillings* the *Load*?

Anſwer. 16 *Pound.* See *page* 215.

4
Comp. of *Direct*, and *Inverſe.*

IF when the *Load* is worth $12\frac{9}{13}$ *Shillings*, for 11 *Pence* you may have 16 *Pound* of Bread; *how many Pound* ſhould you have for 13 *Pence*, when the *Load* is worth 30 *Shillings*?

Anſwer. 8 *Pound.* See *page* 215.

5
Intirely Direct.

IF when the *Load* of Wheat coſts 30 *Shillings*, 8 *Pound* of Bread coſt 13 *Pence*; *how much*, when the ſaid *Load* is worth but $12\frac{9}{13}$ *Shillings*, ſhould a Loaf of 16 *Pound* coſt in Proportion?

Anſwer. 11 *Pence.* See *page* 206.

6
Intirely Direct.

IF when the *Load* is worth $12\frac{9}{13}$ *Shillings*, a Loaf of 16 *Pound* coſts 11 *Pence*; *how much*, when the ſaid *Load* coſts 30 *Shillings*, will a Loaf of 8 *Pound* coſt?

Anſwer. 13 *Pence.* See *page* 206.

OF the 6 *Changes* of this *Queſtion*, the *four firſt* are half *Direct*, and half *Inverſe*; and the *two laſt* are *intirely Direct*, as they ſhould be, according to Reaſon, and the Order of the *Queſtion*.

YOU may obſerve in whatſoever Sort of *Rule of Three* it be, that *no* Term *before* the *Middle*, is ever *multiplied* into *that after* the *Middle*, which anſwers to it, and which has the *ſame Name*; for *one* ſerves to produce the *Diviſor*, and the *other* with the *Middle* to produce the *Dividend*.

If all, or the greateſt Part of the *Terms* have *Fractions*, you ſhould reduce each *Sum* into its *Fraction*, and under the *Terms* that are *whole Numbers* ſet an *Unit*, or 1, making them alſo as *Fractions*. Then, in order to work the *Queſtion*, you muſt *multiply* all the *Uppermoſts* of the *Terms*, which ſhould produce the *Sum* to be *divided*, into all the *Undermoſts* of the *Terms*, which ſhould produce the *Diviſor*, and their *Product* will be the *Dividend*.

In like manner *multiply* all the *Undermoſts* of the *Terms*, which ſhould produce the *Sum* to be *divided* into all the *Uppermoſts* of the *Terms*, which ſhould produce the *Diviſor*, and their *Product* will be the *Diviſor*.

To ſtate properly any *Sum* in the *Double Rule of Three*; of *how many Terms* ſoever it be, you muſt make that the *middle Term*, which correſponds with the *Anſwer*, and denotes the ſame *Sort* of Thing.

The *Sum* being thus ſtated, make as many *ſingle Statings*, as there are *Terms* in the *firſt Part*, that is to ſay, before the *middle Term*, which is to be conſider'd as the *Middle* of every *ſingle Stating* ſeparately; whereby you may find out if they are all *Direct*, or all *Inverſe*; or what *Part* there is of *one Sort*, and *what* of the *other*.

In order to work them ſeparately, the *firſt ſingle Stating* which you would make, muſt have the ſame *middle Term* as the whole Queſtion has; and the *Anſwer* of this *firſt ſingle Stating*, will be the *middle Term* of *that*, which you work *next*; and ſo you muſt continue; making the *Anſwer* of the *laſt ſingle Stateing* you wrought, the *middle Term* of the *next* you have to work, and the *Anſwer* of the *laſt ſingle Stateing* will be the ſame, as *that* of the whole *Queſtion*.

BUT in order to *abbreviate* the *Work*, that you may not have ſo many *ſeparate Statings*, (be they two or three) being all *Direct* or *Inverſe*; ſet down *all* the *Terms before* the *Middlemoſt*, one over the other at the *hither* End, and *thoſe after* the *middle Term*, one over another at the *further* End: if all the Parts of the *Queſtion* be *Direct*, the *Product* of all the *Terms* of the *hither* End *multiplied* together, will be the *Diviſor* to all the *Terms* of the *further* End, *multiplied* together in like manner into the *middle Term*.

IF all the *Parts* be *Inverſe*, then the *Product* of all the *Terms* of the *further* End, will be the *Diviſor* to the *Product* of all the other *Terms*.

BUT if it be partly *Direct*, and partly *Inverſe*, that is to ſay, compoſed of both, then according to good Senſe, and the *Rules* we have laid down, you muſt ſee which are *Direct*, and which are *Inverſe*, and diſpoſe of the Terms in ſuch a Manner, that thoſe which ſhould produce the *Sum* to be *divided*, may be ſet in the *middle* one over another, and thoſe which ſhould produce the *Diviſor*, at *both Ends*.

THAT *End* which ſhould be the *Diviſor* in the *Single Rule*, will ſerve to produce the *Diviſor* in the *Double Rule*; and the *End* of each *Single Stating* which ſhould *multiply* the *middle Term* in working them ſeparately, will be in the *Middle* of the *Double Rule of Three*, and ſerve to produce the *Sum* to be the *Dividend*.

Of the Rule of Conjunction.

The Rule of Conjunction is a Collection of *ſeveral Queſtions* in the *Single Rule of Three*, which are joined together, ſo as to make but *one* of them all.

Firſt Example.

If	8 *Farthings* are worth	2 *Pence*,	How many
And	12 *Pence*	1 *Shil.*	*Pounds are*
And	3 *Pieces* of 1 *Shil.*	1 *Piece* of 3 *s.*	*9600*
And	5 *Pieces* of 3 *Shil.*	3 *Crowns*,	*Farthings*
And	4 *Crowns*	2 *Angels*,	worth ?
And	4 *Angels*	2 *Pounds*;	*Anſw.* 10 *l.*

All the *Terms* in the *hither* End *multiplied* together, produce the *Diviſor*; and all the *Terms* in the *Middle* with *that* which ſtands alone at the *further* End, being alſo *multiplied* together, produce the *Dividend.* Wherefore the *hither* End is *abbreviated* with the *Middle* and *further* End, which is here done: and there remain 10 in the *further* End, which is the *Anſwer.*

In this *Example* you may obſerve, that the *firſt Term* of the *hither* End does, and muſt always, denote the ſame *Sort* of Thing as the *further* End, which is the *laſt Term*; and that of all the other *Terms* of the *hither* End, and the *Middle* which two by two denote the ſame *Sort* of Thing, or have the ſame *Name*, the *one* is in the *Middle*, and the *other* in the *Beginning* of the *next Stating*: So having *Pence* in the *Middle*, you have *Pence* alſo in the *Beginning* of the *next Stating.*

Second Example.

IF 1 *French Crown* be worth 80 *d. Dutch,*
And 415 *d. Dutch* 240 *d. Engliſh,*
And 240 *d. Engliſh* 420 *d. Hamb.*
And 64 *d. Hamburgh* 1 *Florin* of *Frankf.*

How many *Florins* of *Frankfort* are 166 *French Crowns* worth? *Anſw.* 210 *Florins.*

1660 33600
2490 : by 166

2656|0 *Diviſ.* 2016..
2016...
336....

Dividend 557760|0

2656) 557760 (210 *Florins.*
5312

2656
2656

00

Third Example.

IF $\cancel{7}$ *Ells* of *Paris* make $\cancel{9}$ *Yards* of *London*,
And $\cancel{36}$ *Yards* of *London* $\cancel{49}$ *Dutch Ells*,
And $\cancel{7}$ *Dutch Ells* $\cancel{9}$ *Fathoms* of *Milan*,
And $\cancel{3}$ *Fathoms* of *Milan* $\cancel{2}$ *Barres* of *Arragon*,
And $\cancel{5}$ *Barres* of *Arragon* $\cancel{2}$ *Cannes* of *Montpelier*
And $\cancel{9}$ *Cannes* of *Montp.* $\cancel{10}$ *Cannes* of *Touloufe*,

And $\cancel{4}$ *Cannes* of *Toulouſe* $\overset{3}{\cancel{9}}$ *Ells* of *Troy* ;
How many Ells of *Troy* are contained in $\overset{50}{\cancel{100}}$ *Ells* of *Paris* ? *Anſw.* 150 *Ells.*

HAVING *abbreviated* the *hither* End with the *furthermoſt*, and the *Middle*, there are only 3 left in the *Middle*, and 50 in the *further* End, which *multiplied* together produce the *Anſwer.*

IF there had been any Thing left at the *hither* End, it would have been a *Diviſor* to what remained in the *Middle* and *further* End ; and if there had been *ſeveral Numbers* left at the *hither* End, their *Product* muſt have *divided* what was left in the *middle* and *further* End *multiplied* together.

Fourth Example.

IF 100 *lb.* of *Venice* weigh 70 *lb.* of *Lyons*,
And 120 *lb.* of *Lyons* 100 *lb.* of *Roan*,
And 80 *lb.* of *Roan* 100 *lb.* of *Touloufe*,
And 100 *lb.* of *Touloufe* 74 *lb.* of *Geneva*;

96 *Diviſor* of . . 5180

96) 5180 ($53\frac{92}{96}$ or $\frac{23}{24}$
480

380
288

92

How many Pound of *Geneva* will 100 *lb.* of *Venice* weigh?

Anſwer. 54 *Pound* all but $\frac{1}{24}$ of a *Pound.*

HENCE you ſee by the *Rule of Conjunction*, you may find what Relation one Thing has to another, which before was unknown: Thus not knowing what Proportion the *Weights* of *Geneva* bear to the *Weights* of *Venice*, you may find it by knowing what Proportion the *Weights* of *Venice* bear to thoſe of *Lyons*, thoſe of *Lyons* to thoſe of *Roan*, thoſe of *Roan* to thoſe of *Toulouſe*, and thoſe of *Toulouſe* to thoſe of *Geneva*.

FROM hence, I think, you may ſee the Uſe and Advantage of this *Rule*, without any further *Explanation*.

IF out of Curioſity you have a Mind to work ſeparately all the *ſingle Statings*, which compoſe this *conjunct Queſtion*, you muſt ſet down the *firſt Term* of the *Middle* in the *conjunct Queſtion*, for the *firſt Term* of the *firſt ſingle Stating*; ſetting in the *Middle*, the *firſt Term* of the *conjunct Queſtion*; and for the *laſt Term*, the *firſt Term* of the ſecond *Line* in the *conjunct*; and if you ſuppoſe the Example above, your Anſwer will be *Pounds* of *Venice*, which will be the middle Term in every *ſingle Stating* except in the *laſt*, where the middle Term will be *Pounds* of *Geneva*.

Fifth Example.

If 4 *Pears* be worth 2 *Apples*,
And 3 *Apples* . . 2 *Oranges*,
And 4 *Oranges* . . 8 *Pence*;
How many Pence are 12 *Pears* worth?

Anſw. 8 *Pence.*

To illuſtrate this, you may conſider, that
If 2 *Apples* are worth 4 *Pears*,
Then 3 *Apples* . . . 6 *Pears*,
or 2 *Oranges*.

And if 2 *Oranges* . . 6 *Pears*,
then 4 *Oranges* . . 12 *Pears*,
or 8 *Pence*:

Proof.

If 12 *Pears* are worth 8 *Pence*,
2
And 8 *Pence* . . . 4 *Oranges*,
And 2 *Oranges* . . . 3 *Apples*;
{ *How many Apples* are 4 *Pears* worth?

Anſw. 2 *Apples*.

Another Proof.

If for 8 *Pears* you have 12 *Pears*,
And for 4 *Pears* . . . 2 *Apples*,
And for 3 *Apples* . . 2 *Oranges*;
{ *How many Oranges* may one have for
2
8 *Pence*?

Anſw. 4 *Oranges*.

Another Proof.

If 3 *Apples* are worth 2 *Oranges*,
And 4 *Oranges* . . 8 *Pence*,
And 8 *Pence* . . . 12 *Pears*;
{ *How many Pears* may be had for 2 *Apples*?

Anſw. 4 *Pears*.

Another Proof.

IF 4 *Oranges* coſt . . 8 *Pence*,
And for 8 *Pence* you have 12 *Pears*,
And for 4 *Pears* you have 2 *Apples*;
How many Apples may you have for 2 *Oranges*?

Anſw. 3 *Apples.*

Another Proof.

IF 2 *Apples* are worth 4 *Pears*,
And 12 *Pears* . . . . . 8 *Pence*,
And 8 *Pence* . . . . . 4 *Oranges*;
How many Oranges are 3 *Apples* worth?

Anſw. 2 *Oranges.*

Another Proof.

IF for 8 *Pence* you have 4 *Oranges*,
And for 2 *Oranges* . . 3 *Apples*,
And for 2 *Apples* . . 4 *Pears*;
How many Pears may you have for 8 *Pen.*?

Anſw. 12 *Pears.*

Another Proof.

If 2 *Oranges* are worth 3 *Apples*,
And 2 *Apples* . . . 4 *Pears*,
And 12 *Pears* . . . 8 *Pence*;
How many Pence are 4 *Oranges* worth?
Anſw. 8 *Pence.*

In Matters relating to Foreign *Exchange*, 'tis ſufficient to be well acquainted with the *Rules of Three*, eſpecially the *Direct* and *Conjunct*; as for the *Rule of Three Inverſe*, 'tis very ſeldom required in *Exchange*.

Examples.

I. If 7 *Ells* of *Paris* make 9 *Yards* of *London*, how many *Yards* of *London* will 49 *Ells* of *Paris* make? *Anſw.* 63 *Yards* of *London*.

And if 9 *Yards* of *London* make 7 *Ells* of *Paris*; how many *Ells* of *Paris* will 63 *Yards* of *London* make? *Anſw.* 49 *Ells* of *Paris*.

II. If 100 *Pounds* of *Venice* weigh 70 *Pounds* of *Lyons*; how many *Pounds* of *Lyons* will 1000 *Pounds* of *Venice* weigh? *Anſw.* 700 *Pounds* of *Lyons*.

And if 70 *Pounds* of *Lyons* weigh 100 *Pounds* of *Venice*; how many *Pounds* of *Venice* do 700 *Pounds* of *Lyons* weigh? *Anſw.* 1000 *Pounds* of *Venice*.

III. If 60 *French Pence* be worth 80 *Dutch Pence*; how many *Dutch Pence* are 360 French *Pence* worth? *Anſw.* 480 *Dutch Pence.*

And if 80 *Dutch Pence* be worth 60 *French Pence*; how many *French Pence* are 480 *Dutch Pence* worth? *Anſw.* 360 *French Pence.*

These are the three Sorts of Foreign *Exchange* that happen in *Trade*, which you ſee are very eaſy, provided you know the true Proportion between Things of one Country and thoſe of another.

There are ſome *Particularities* in *Exchange* of *Coins*, which we ſhall treat of more largely, when we come to *Exchange*.

FELLOWSHIP.

THIS *Rule* is ſerviceable to *Merchants* who enter into Partnerſhip, to ſhare their *Gain* or *Loſs*; it is much uſed by the *Receivers of Taxes*, and *Paymaſters* of the *Army*; and by all who have the Care of *publick Stocks*, &c.

Example.

THREE *Merchants* enter into *Partnerſhip*, or make a *Company* to *trade* together, and raiſe a *Stock* of 3000 *Pounds*, with which they *gain* 1200 *Pounds*; the *Queſtion* is, *what Share* belongs to *each* particular Perſon.

The *Firſt* put in 1500 *Pounds.*
The *Second* put in 900 *Pounds.*
The *Third* put in 600 *Pounds.*

THE three *Partners* have put in 3000 *Pounds*: with which they *gained* 1200 *Pounds.*

Now in order to find what Share belongs to each Perſon in proportion to the Sum he put into Stock, you need but ſay;

If 3000 *l. gain* 1200 *l. How much* will 1500 *l.* (which the *firſt Partner* put into *Stock*) *gain?*

Anſwer. The 1500 *Pounds* of the *firſt Partner* produce him 600 *Pounds* for his *Share* of Profit.

If the 3000 *l. gain* 1200 *l. How much* will the 900 *l.* of the *ſecond Partner gain? Anſwer.* 360 *Pounds.*

If 3000 *l. gain* 1200 *l. How much* does the 600 *l.* of the *third gain? Anſwer.* 240 *Pounds.*

The *firſt Partner* has for his *Share* of the *Profit* 600 *l.*
The *ſecond* has . . . . 360 *l.*
And the *third* has . . . . 240 *l.*

Proof. The 3 *Sums* added together make 1200 *l.* the whole *Profit* that was to be ſhared amongſt them.

This Rule is ſo eaſy, that it needs no further *Explanation*; for when there are *Shillings* or *Pence*, or *Fractions* after the *Pounds*, it is wrought by the ſame *Principles*, and according to the ſame *Way* of *Reaſoning.*

FELLOWSHIP *with Time.*

A *certain Perſon* enters into *Trade* with 2000 *l.*

Five Months afterwards, another enters into *Partnerſhip* with him and brings in 3000 *l.*

And *one Month* after that, they take in *another* Partner, who puts in . . . . . 5000 *l.*

The *Total* of what the *three* Partners put in at different Times . . . . . . 10000 *l.*

Three Months after the *laſt* Perſon was taken into *Partnerſhip*, the Profit is found to be 2500 *Pounds*; which they being willing to ſhare, it is required to know *what Part* belongs to *each* Perſon in Proportion to the *Sum* he put in, and the *Time* he was in Company?

YOU muſt obſerve the *firſt* Partner was 5 *Months* by himſelf, and afterwards he was 4 *Months* with the *Second*, and 3 *Months* with the *Third*: The whole Time of *Trading* was but 9 *Months*, during all which Time the *firſt* Man's Money was in *Trade*.

THE *ſecond* Man's Money was improving but 4 *Months* of the 9.

AND that of the *Third* but 3 of theſe 9 *Months*.

WHEREFORE you ſhould *multiply* the *firſt* Man's 2000 *Pounds* by 9 *Months*, which produce for him . . . . . . 18000 *l.*

THE 3000 *Pounds* of the *Second* by 4 *Months* produces for him . . . . . 12000 *l.*

AND the 5000 *Pounds* by 3 *Months* produce for the *Third* . . . . . . 15000 *l.*

The *Total* of all *Three* . . . . . . 45000 *l.*

ALL that you have more to do, is to ſay;
IF the 45000 *l.* of the *three* Partners *gain* 2500 *l.*
How much will the 18000 of the *Firſt?*
How much will the 12000 of the *Second?*
How much will the 15000 of the *Third?*

HAVING *abbreviated*, and wrought the *three Statings* of the *Rule of Three* after the uſual Way,

The 1*ſt* for 2000 *l.* for 9 *M.* will have 1000 *l. Profit.*
The 2*d* for 3000 *l.* for 4 *M.* will have 666 *l.* 13*s.* 4*d.*
The 3*d* for 5000 *l.* for 3 *M.* will have 833 *l.* 6 *s.* 8 *d.*
For Proof. Add up theſe *three Sums*,

and you will have again the . . . 2500 *l.* which was ſhared out in Proportion.

Another Sum.

THREE *Partners* made a *Stock* of 6000 *Pounds*, with which they *gained* 1500 *Pounds*, which they being willing to ſhare amongſt themſelves, deſire to know how much belongs to *each* Perſon, in proportion to *his Intereſt* therein.

The 1*ſt* has . 6 *Pence*, or $\frac{1}{2}$
The 2*d* . . . 4 *Pence*, or $\frac{1}{3}$
The 3*d* . . . 2 *Pence*, or $\frac{1}{6}$
of each *Shilling* of the *Stock*, which is 6000 *Pounds*.

To ſolve this *Queſtion*, you muſt multiply the 1500 *Pounds* Profit by 6 *Pence*; which is done by taking the $\frac{1}{2}$ of the ſaid 1500 *Pounds*, which gives for the *firſt* . . . . 750 *Pounds*.

By 4 *Pence*, in taking the *Third*, which gives for the *Second* . . .	500 *Pounds*.
By 2 *Pence*, in taking the *Sixth*, which gives for the *Third*	250 *Pounds*.
Proof.	1500 *Pounds*.

Five others join *Company*, and make a *Stock* of 6000 *Pounds*, of which the *firſt* put in the *Half*, or 10 *Shillings* per *Pound*.

The 2*d* put in the $\frac{1}{5}$,	or 4 *s*.	*per l*.	That is to ſay, *per* each *l*. which compoſes the Stock of 6000 *l*.
The 3*d* put in the $\frac{1}{6}$,	or 3 *s*. 4 *d*.	*per l*.	
The 4*th* put in the $\frac{1}{12}$,	or 1 *s*. 8 *d*.	*per l*.	
The 5*th* put in the $\frac{1}{20}$,	or 1 *s*.	*per l*.	
All the *Fractions*	1 *l*. or 20 *s*.		

If you would know *how much* of the 2000 *Pounds* Profit each muſt have, you muſt *multiply* theſe ſaid . . . . 2000 *l*.

by 10 *s*. which gives for the *firſt*	1000 *l*.		
by 4 *s*. which gives for the 2*d* .	400 *l*.		
by 3 *s*. 4 *d*. which gives for the 3*d*	333 *l*.	6 *s*.	8 *d*.
by 1 *s*. 8 *d*. which gives for the 4*th*	166 *l*.	13 *s*.	4 *d*.
by 1 *s*. which gives for the 5*th* .	100 *l*.		
Proof.	2000 *l*.		

IF you deſire to know *what Sum each* Perſon put into *Stock*, you may find that alſo by *multiplying* the *Stock* 6000 *Pounds*, in like manner as you have *multiplied* the 2000 *Pounds* Profit; and you will have

3000 *l.* the *firſt* Man's *Part* of the *Stock.*
1200 *l.* the *ſecond* Man's *Part.*
1000 *l.* the *third* Man's *Part.*
500 *l.* the *fourth* Man's *Part.*
300 *l.* the *fifth* Man's *Part.*

comes to 6000 *l.* the *Capital Stock.*

BUT ſuppoſe you only knew the *Sum* which each *Partner* put into *Stock*, and would willingly know in *what Part* of a *Pound*, or, which is all the ſame Thing, in *how many Shillings per Pound* each *one* is intereſted; you ſhould work ſo many *Sums* of Proportion: As for Inſtance in this laſt *Example*, ſay; If 6000 *Pounds Stock* come from 20 *Shillings*; from *how much* come

The 3000 *l.* of the 1*ſt*? *Anſ.* from 10 *s.* or $\frac{1}{2}$.
The 1200 *l.* of the 2*d*? *Anſ.* from 4 *s.* or $\frac{1}{5}$.
The 1000 *l.* of the 3*d*? *Anſ.* from 3 *s.* 4*d.* or $\frac{1}{6}$.
The 500 *l.* of the 4*th*? *Anſ.* from 1 *s.* 8*d.* or $\frac{1}{12}$.
And the 300 *l.* of the 5*th*? *Anſ.* from 1 *s.* or $\frac{1}{20}$.

WHEN the *Company* ſuſtains a *Loſs*, you muſt find *what Part* thereof *each Man* ſhould bear, in proportion to his *Share* of the *Stock*, in like manner as in *Sharing* of *Profit*; ſo that there is no new Difficulty ariſes in this reſpect.

Another, with ſeveral Times putting in, and taking out.

THREE *Merchants* join in *Company* for 15 *Months*, at the End of which, they find they have gained 450 *Pounds*, which they are inclin'd to ſhare;

The *firſt* put 500 *Pounds* into *Stock*, which he
left there 8 *Mo.* which gives 4000 *l.*
At the End of theſe 8 *Months*,
he takes out 220 *Pounds*; then

there remain but 280 *Pounds*, the other
7 *Months*, which give . . . . 1960 *l.*

ſo that the *firſt* Man's *Total* comes to 5960 *l.*

The *ſecond* put 200 *Pounds* into *Stock*, which he
left there 6 *Mo.* which make 1200 *l.*
At the End of theſe 6 *Months*, *he*
put in 190 *Pounds* more;

which being 390 *Pounds* for
9 *Months*, they produce 3510 *l.*

ſo the *ſecond* Man's *Total* comes to 4710 *l.*

The *third* put in 300 *Pounds*, which he continued in *Stock* all the 15 *Months*, without taking any Part of it out; which being therefore *multiplied* by 15 *Months*,

gives . . 4500 *Pounds* his *Total*,
which join'd to 5960 *Pounds*, the *Total* of the 1*ſt*,
and to . . . 4710 *l.* the *Total* of the 2*d*,

make the *Stock*
of the 3 *Partners* 15170 *Pounds*,

with which they gain'd the 450 *Pounds* Profit, as above-mentioned; which is eaſily divided into their Shares, ſince you have found every Man's *Total* in particular.

YOU muſt then work three little *Sums* of Proportion, abbreviated after the uſual Manner, ſaying;

IF 15170 *l.* *gain* 450 *l.* *how much*
5960 *l.* of the *firſt* ? *Anſ.* 176 *l.* 16 *s.*
4710 *l.* of the *ſecond* ? *Anſ.* 139 *l.* 14 *s.* 4 *d.*
4500 *l.* of the *third* ? *Anſ.* 133 *l.* 9 *s.* 8 *d.*

Proof. 450 *l.*

TWO *others* join *Company*, and make a *Stock* of 1500 *Pounds*; of which the firſt put in 900 *Pounds*, upon Condition that he ſhould *gain* after the Rate of 10 *per Cent.* and the ſecond put in 600 *Pounds*, upon Condition that he ſhould gain after the Rate of 8 *per Cent.* The *Queſtion* is, *how much* belongs to *each*, of the 800 *Pounds*, which they have *gained* ?

TO work this *Queſtion*, you need but *multiply*
the . . 900 *Pounds* of the *firſt*
by the . 10 *per Cent.* which will give 9000 *l.*
and the . 600 *Pounds* of the *ſecond*
by his . . . 8 *per Cent.* will give . . . 4800 *l.*
Total . . . 13800 *l.*

THEN ſay; if 13800 *l. gain* 800 *l. How much*
the 9000 *l.* of the 1*ſt*? *Anſ.* 521 *l.* 14 *s.* 9 *d.* $\frac{54}{138}$
the 4800 *l.* of the 2*d*? *Anſ.* 278 *l.* 5 *s.* 2 *d.* $\frac{84}{138}$

Proof 800 *l. exactly.*

Another.

Two Men having *gain'd* 760 *l.* which they find to be 10 *per Cent. Profit*; of which the *firſt* is to have one *Fourth* more than the *laſt*, (that is to ſay, 5 to the others 4) the *Queſtion* is, *how much* each one put into *Stock*, and what he *gain'd.*

ADD 5 *Pounds* of the *firſt* to 4 *Pounds* of the *ſecond*, which makes the *Total* 9 *Pounds*; and then ſay;

IF 9 *Pounds* gain 760 *Pounds*;
How much the 5 *l.* of the 1*ſt*? *Anſ.* 422 *l.* 4 *s.* 5 $\frac{1}{3}$ *d.*
How much the 4 *l.* of the 2*d*? *Anſ.* 337 *l.* 15 *s.* 6 $\frac{2}{3}$ *d.*

Proof. 760 *l.*

AND to know *how much* each in particular put into *Stock*; you muſt ſay;

IF 10 *l.* be the Profit of 100 *l.* of what is the
422 *l.* 4 *s.* 5 $\frac{1}{3}$ *d.* of the 1*ſt*? *Anſ.* of 4222 *l.* $\frac{2}{9}$.
and the 337 *l.* 15 *s.* 6 $\frac{2}{3}$ *d.* of the 2*d*? *Anſ.* of 3377 *l.* $\frac{7}{9}$.
For Proof, you ſee that 760 *l.* are the
Profit at 10 *per cent.* ariſing from 7600 *l.*

Another.

FOUR *Men* ſhare among themſelves 400 *l.* which they have *gained*; the *firſt* takes the $\frac{1}{2}$ of it, the *ſecond* takes the $\frac{1}{3}$ of it, the *third* takes the $\frac{1}{4}$ of it, the *fourth* takes the $\frac{1}{6}$ of it; the *Queſtion* is what *each one* takes in particular.

TO reſolve this *Queſtion*, and all others of the ſame *Sort*, you muſt find the *leaſt Number* you can, which may be divided exactly, and without any *Remainder*, by all the *Undermoſts* of our *four Fractions*.

NOW 12 being this *leaſt Number*, you muſt take the $\frac{1}{2}$, the $\frac{1}{3}$, the $\frac{1}{4}$, and the $\frac{1}{6}$ of it, which are 6, 4, 3, and 2, that makes 15, and then ſay;

IF 15 *l.* proceed from 12 *l.* from what do 400 *l.* proceed? *Anſ.* from 320 *l.*

Then of 320 *l.*
The *Half* is 160 *l.* for the 1*ſt*.
The *Third* is 106 *l.* 13 *s.* 4 *d.* for the 2*d*.
The *Fourth* is 80 *l.* for the 3*d*.
The *Sixth* is 53 *l.* 6 *s.* 8 *d.* for the 4*th*.
Adding theſe *four*
Sums together, make 400 *l.* the *Proof*.

If you deſire to know *how much each* particular Perſon put into *Stock*, you muſt firſt find the *whole Stock*, and then work as above; for every one has the *ſame* Proportion of the *Stock*, as of the *Profit*.

Another Example.

A *Man* upon his Death-bed orders by his Will, that if his *Wife*, who was with Child, ſhould be brought to Bed of a *Son*, this *Son* ſhould have *two Thirds* of what he leaves, which is 50000 *l.* and his *Wife* the other *Third*; but if ſhe ſhould have a *Daughter*, then the *Mother* ſhould have *two Thirds*, and the *Daughter* one *Third*. Now it happens the *Woman* is brought to Bed of both a *Son* and a *Daughter*; the *Queſtion* is, *how much each* of the *Three* is intitled to, according to the Will of the Deceaſed.

Observe, the *Son* is to have twice as much as the *Mother*, and the *Mother* twice as much as her *Daughter*: Wherefore if the *Son* take 4, the *Mother* will have two; and if the *Mother* has 2, the *Daughter* will have 1: Then you need only add 4, and 2, and 1 together; which makes 7 for the *firſt Term* of the *three* following *Sums* of Proportion.

If the 7 *Parts* are to have		50000 *l.*
How much will the *Son's* 4 have?	*Anſ.*	28571 $\frac{3}{7}$ *l.*
How much will the *Mother's* 2 have?	*Anſ.*	14285 $\frac{5}{7}$ *l.*
And *How much* the *Daughter's*?	*Anſ.*	7142 $\frac{6}{7}$ *l.*
	Proof.	50000 *l.*

Another Example.

Five old Partners receive into *Partnerſhip four new* Ones, on Condition that each *old* Partner ſhould have *twice* as much *Profit* as each *new one*; the *Queſtion* is, *how much each one* ſhould have of 300000 *l.* which they have *gained*?

To reſolve this, and all ſuch-like *Queſtions*, you muſt reaſon after this Manner: Since *each old* Partner has *twice* as much as *each new* one, *each new* Partner can have but *half* as much as *each old* one: Then,

4 *new* Partners taking 1 *apiece*, will have 4. And 5 *old* Partners taking 2 *apiece*, will have 10. And adding up the 4 *Shares* of the *new* Partners, to the 10 of the *old* Partners, you will have 14, for the *firſt Term* of the *two* following *Sums* of Proportion.

If 14 *Shares* gain 300000 *l.*
How much the 10 of the *old* Partners?
How much the 4 of the *new* Partners?

Anſ. 214285 $\frac{5}{7}$ *l.* for the *five old* Partners, the *fifth Part* of which is 42857 $\frac{1}{7}$ *l.* for *each.*

And . . 85714 $\frac{2}{7}$ *l.* for the *four new* Partners, the *fourth* of which is . . . 21428 $\frac{4}{7}$ *l.* for *each.*

300000 *Proof.* As a *Proof*, you ſee that *each old* Partner has *twice* as much as *each new* one.

Another.

Another Example.

Seven Merchants take into *Company* 4 *Factors*, and 2 *Servants*, on Condition that each *Merchant* ſhall have *three* times as much as each *Factor*, and each *Factor* *twice* as much as each *Servant*; 'tis required to find *How much* each one muſt have of 7000 *Pounds*, which they have *gained?*

YOU muſt ſay; if each *Merchant* has 3 times as much as each *Factor*, and each *Factor twice* as much as each *Servant;*

Then let each *Servant* take 1,
which will be 2, for the two *Servants.*
Each *Factor* take 2,
which will be 8, for the four *Factors.*
And each *Merchant* take 6,
which will be 42 for the ſeven *Merchants.*

All their *Shares* make 52, for the *firſt Term* of the *three* following *Sums* of *Proportion.*

IF 52 *Shares* have 7000 *Pounds* ; *How much*
42 of the ſeven *Merchants* ?
8 of the four *Factors* ?
2 of the two *Servants* ?

AND working theſe three *Statings* after the common Way, you will have for

the 7 *Merch.* 5653 $\frac{11}{13}$ *l.* of w^{ch} $\frac{1}{7}$ is 807 $\frac{63}{91}$ *l.* for each.
the 4 *Factors* 1076 $\frac{12}{13}$ *l.* of w^{ch} $\frac{1}{4}$ is 269 $\frac{3}{13}$ *l.* for each.
the 2 *Servants* 269 $\frac{3}{13}$ *l.* of w^{ch} $\frac{1}{2}$ is 134 $\frac{8}{13}$ *l.* for each.

Proof . . 7000 *Pounds.*

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Five old Partners receive into *Partnerſhip four new* Ones, on Condition that each *old* Partner ſhould have *twice* as much *Profit* as each *new one*; the *Queſtion* is, *how much each one* ſhould have of 300000 *l.* which they have *gained* ?

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If 14 *Shares* gain 300000 *l.*
How much the 10 of the *old* Partners?
How much the 4 of the *new* Partners?

Anſ. 214285 $\frac{1}{7}$ *l.* for the *five old* Partners, the *fifth Part* of which is 42857 $\frac{1}{7}$ *l.* for *each.*

And . . 85714 $\frac{2}{7}$ *l.* for the *four new* Partners, the *fourth* of which is . . . 21428 $\frac{4}{7}$ *l.* for *each.*

300000 *Proof.* As a *Proof*, you ſee that *each old* Partner has *twice* as much as *each new* one.

Another.

Another Example.

Seven Merchants take into *Company* 4 *Factors*, and 2 *Servants*, on Condition that each *Merchant* ſhall have *three* times as much as each *Factor*, and each *Factor* *twice* as much as each *Servant*; 'tis required to find *How much* each one muſt have of 7000 *Pounds*, which they have *gained*?

You muſt ſay; if each *Merchant* has 3 times as much as each *Factor*, and each *Factor twice* as much as each *Servant*;

Then let each *Servant* take 1,
which will be 2, for the two *Servants.*
Each *Factor* take 2,
which will be 8, for the four *Factors.*
And each *Merchant* take 6,
which will be 42 for the ſeven *Merchants.*

All their *Shares* make 52, for the *firſt Term* of the *three* following *Sums* of *Proportion.*

If 52 *Shares* have 7000 *Pounds*; *How much*
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8 of the four *Factors*?
2 of the two *Servants*?

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the 2 *Servants* 269 $\frac{3}{13}$ *l.* of w^{ch} $\frac{1}{2}$ is 134 $\frac{8}{13}$ *l.* for each.

Proof . . 7000 *Pounds.*

For another *Proof.* You ſee that the 807 $\frac{82}{91}$ *l.* which come to each *Merchant*, are 3 times the *Share* of each *Factor*, and 6 times as much as what each *Servant* is to have, which is but *half* as much as belongs to each *Factor.*

Another Example.

Two or *three hundred* Perſons having *gain'd* 20 *per Cent.* 'tis required to know *how* this muſt be *ſhared* amongſt them, in Proportion to the *Intereſt* each one has in the *Stock*, without knowing what is the whole *Stock*, or *how much* each particular Perſon put in?

This is impoſſible in one Senſe, and poſſible in another.

This *Queſtion* is reſolved after the uſual Method, when you know the *Stock*, and particular *Shares.* But ſince it would be too long to work *two* or *three hundred Statings* of the *Rule of Three*, you may avoid them by drawing up a *Tariff* after the following Model, which is laid down for another *Example*, ſince this has no need of it; for 20 *per Cent.* Profit is juſt $\frac{1}{5}$, or 4 *Shillings per Pound*; and every *Partner* need but take the *fifth* Part of the *Sum* he put in, to find his *Share* of the *Profit.*

But ſuppoſe, for Example, the Profit was but 8 *per Cent.* then it would be the ſhorteſt and eaſieſt Way to draw up a *Tariff*, as the following Model; and ſay;

If 100 *l.* *gain* 8 *l.* what will 1 *l.* *gain?* *Anſwer.* 1 *s.* 7 $\frac{1}{5}$ *d.* And, if 1 *l.* *gains* 1 *s.* 7 $\frac{1}{5}$ *d.* what will 1 *s.* *gain?* *Anſwer.* $\frac{24}{25}$ of a *Penny.*

He that put in	1 Shilling *will have*		$\frac{24}{25}$ of a Pen.
	2 Shillings *will have*	1 Pen. $\frac{23}{25}$ *d.*	
	3 Shillings *will have*	2 Pen. $\frac{22}{25}$ *d.*	
	4 Shillings *will have*	3 Pen. $\frac{21}{25}$ *d.*	
	5 Shillings *will have*	4 Pen. $\frac{20}{25}$ *d.*	
	6 Shillings *will have*	5 Pen. $\frac{19}{25}$ *d.*	
	7 Shillings *will have*	6 Pen. $\frac{18}{25}$ *d.*	
	8 Shillings *will have*	7 Pen. $\frac{17}{25}$ *d.*	
	9 Shillings *will have*	8 Pen. $\frac{16}{25}$ *d.*	
	10 Shillings *will have*	9 Pen. $\frac{15}{25}$ *d.*	

1 Pound *will have*	1 Shil.	7 $\frac{1}{5}$ Pence.
2 Pounds *will have*	3 Shil.	2 $\frac{2}{5}$ Pence.
3 Pounds *will have*	4 Shil.	9 $\frac{3}{5}$ Pence.
4 Pounds *will have*	6 Shil.	4 $\frac{4}{5}$ Pence.
5 Pounds *will have*	8 Shil.	exactly.
6 Pounds *will have*	9 Shil.	7 $\frac{1}{5}$ Pence.
7 Pounds *will have*	11 Shil.	2 $\frac{2}{5}$ Pence.
8 Pounds *will have*	12 Shil.	9 $\frac{3}{5}$ Pence.
9 Pounds *will have*	14 Shil.	4 $\frac{4}{5}$ Pence.

He that put in	10 Pounds *will have*		16 Shillings.
	20 Pounds *will have*	1 Pound	12 Shillings.
	30 Pounds *will have*	2 Pounds	8 Shillings.
	40 Pounds *will have*	3 Pounds	4 Shillings.
	50 Pounds *will have*	4 Pounds.	
	60 Pounds *will have*	4 Pounds	16 Shillings.
	70 Pounds *will have*	5 Pounds	12 Shillings.
	80 Pounds *will have*	6 Pounds	8 Shillings.

He that put
in 90 Pounds *will have* 7 Pounds 4 Shillings.
100 Pounds *will have* 8 Pounds.
200 Pounds *will have* 16 Pounds.
300 Pounds *will have* 24 Pounds.
400 Pounds *will have* 32 Pounds.
500 Pounds *will have* 40 Pounds.
600 Pounds *will have* 48 Pounds.
700 Pounds *will have* 56 Pounds.
800 Pounds *will have* 64 Pounds.
900 Pounds *will have* 72 Pounds.
1000 Pounds *will have* 80 Pounds.
2000 Pounds *will have* 160 Pounds.
3000 Pounds *will have* 240 Pounds.
4000 Pounds *will have* 320 Pounds.
5000 Pounds *will have* 400 Pounds.
6000 Pounds *will have* 480 Pounds.
7000 Pounds *will have* 560 Pounds.
8000 Pounds *will have* 640 Pounds.
9000 Pounds *will have* 720 Pounds
10000 Pounds *will have* 800 Pounds.

WERE there an *Hundred thouſand* Perſons, that had a *Share* in this *Profit* of 8 *per Cent. every particular* Perſon might find in this *Tariff* his *particular Share*, in *Proportion* to the *Sum* he put in.

FOR *Example*; ſuppoſe any one had put in 19978 *Pounds* 13 *Shillings*; he muſt take

what is againſt the	10000 *l.* w^{ch} is	800 *l.*	
what is againſt the	9000 *l.* w^{ch} is	720 *l.*	
what is againſt the	900 *l.* w^{ch} is	72 *l.*	
what is againſt the	70 *l.* w^{ch} is	5 *l.*	12 *s.*
what is againſt the	8 *l.* w^{ch} is		12 *s.* 9 $\frac{3}{5}$ *d.*
what is againſt the	10 *s.* w^{ch} is		9 $\frac{15}{25}$ *d.*
and what is againſt	3 *s.* w^{ch} is		2 $\frac{22}{25}$ *d.*
And 1997 8 *l.* 13 *s.*	would have	1598 *l.*	5 *s.* 10 $\frac{2}{25}$ *d.*

Another Tariff.

SUPPOSE the King was to leſſen in any Diſtrict 9000 *Pounds*, which had paid the *laſt Year* 80000 *Pounds*; the *Queſtion* is *what each* Inhabitant of this Diſtrict is to pay leſs than before?

AFTER every one has declared what he paid the *laſt Year*, you will ſoon find by the following *Tariff*, *How much leſs* he ought to pay *this Year*; to make which *Tariff*, you muſt firſt ſee, *How much* 1 *Pound* is *leſs*, and *how much* 1 *Shilling*; ſaying,

IF 80000 *Pounds* diminiſh 9000 *Pounds*; *How much* does 1 *Pound* or 20 *Shillings*? *Anſ.* 2 *s.* 3 *d.* the 20*th* Part of which is 1 $\frac{7}{20}$ of a *Penny*, which is ſunk or diminiſh'd in 1 *Shilling*.

1 Shilling *ſinks*	1 *d.* $\frac{7}{20}$.
2 Shillings *ſink*	2 *d.* $\frac{14}{20}$.
3 Shillings *ſink*	4 *d.* $\frac{1}{20}$.
4 Shillings *ſink*	5 *d.* $\frac{8}{20}$.
5 Shillings *ſink*	6 *d.* $\frac{15}{20}$.

6 Shillings *ſink*			8 *d.* $\frac{2}{20}$.
7 Shillings *ſink*			9 *d.* $\frac{9}{20}$.
8 Shillings *ſink*			10 *d.* $\frac{16}{20}$.
9 Shillings *ſink*		1 *s.*	0 *d.* $\frac{3}{20}$.
10 Shillings *abate*		1 *s.*	1 *d.* $\frac{10}{20}$.
1 Pound *abates*		2 *s.*	3 *d.* *exact.*
2 Pounds *abate*		4 *s.*	6 *d.*
3 Pounds		6 *s.*	9 *d.*
4 Pounds		9 *s.*	0 *d.*
5 Pounds		11 *s.*	3 *d.*
6 Pounds		13 *s.*	6 *d.*
7 Pounds		15 *s.*	9 *d.*
8 Pounds		18 *s.*	0 *d.*
9 Pounds	1 *l.*	0 *s.*	3 *d.*
10 Pounds	1 *l.*	2 *s.*	6 *d.*
20 Pounds	2 *l.*	5 *s.*	
30 Pounds	3 *l.*	7 *s.*	6 *d.*
40 Pounds	4 *l.*	10 *s.*	
50 Pounds	5 *l.*	12 *s.*	6 *d.*
60 Pounds	6 *l.*	15 *s.*	
70 Pounds	7 *l.*	17 *s.*	6 *d.*
80 Pounds	9 *l.*		
90 Pounds	10 *l.*	2 *s.*	6 *d.*
100 Pounds	11 *l.*	5 *s.*	
200 Pounds	22 *l.*	10 *s.*	
300 Pounds	33 *l.*	15 *s.*	
400 Pounds	45 *l.*		
500 Pounds	56 *l.*	5 *s.*	
600 Pounds	67 *l.*	10 *s.*	

700 Pounds	78 *l.*	15 *s.*
800 Pounds	90 *l.*	
900 Pounds	101 *l.*	5 *s.*
1000 Pounds	112 *l.*	10 *s.*
2000 Pounds	225 *l.*	
3000 Pounds	337 *l.*	10 *s.*
4000 Pounds	450 *l.*	
5000 Pounds	562 *l.*	10 *s.*
6000 Pounds	675 *l.*	
7000 Pounds	787 *l.*	10 *s.*
8000 Pounds	900 *l.*	
9000 Pounds	1012 *l.*	10 *s*
10000 Pounds	1125 *l.*	
20000 Pounds	2250 *l.*	
30000 Pounds	3375 *l.*	
40000 Pounds	4500 *l.*	
50000 Pounds	5625 *l.*	
60000 Pounds	6750 *l.*	
70000 Pounds	7875 *l.*	
80000 Pounds	9000 *l.*	

To ſhew you how to make uſe of this *Tariff* above; ſuppoſe any one paid 432 *Pounds* the *laſt Year*, and you would find what he is now to pay *leſs*?

Over-againſt	400 *l.* is	45 *l.*	
over-againſt	30 *l.* is	3 *l.*	7 *s.* 6 *d.*
over-againſt	2 *l.* is		4 *s.* 6 *d.*
And	432 *l.* leſſen	48 *l.* 12 *s.*	

From	432 *l.* which he paid,		
taking away	48 *l.*	12 *s.*	
leaves	383 *l.*	8 *s.*	to be paid *this Year.*

You muſt proceed in like Manner to all the other Inhabitants, were there a *Thouſand* of them, and find *how much leſs* each one ought to pay, in *Proportion* to what he paid the *laſt Year*. And if there was an *Augmentation* of 9000 *Pounds* to be made, you muſt follow the ſame *Principles*, and add the 48 *Pounds* 12 *Shillings*, above, to the 432 *Pounds*, inſtead of *ſubtracting* them, which would give 480 *Pounds* 12 *Shillings*.

Of Bankruptcy.

A *Man* turns *Bankrupt* for 80000 *l.* and his Effects are valued at no more than 9000 *l.* The *Queſtion* is, how much each *Creditor* will have in *Proportion* to his *Debt*?

THIS *Queſtion* is reſolved, in like manner as the foregoing, with ſuch a *Tariff*; but becauſe that is ſomewhat long, we ſhall ſhew you how to reſolve it by another (which we chuſe to call a *Tariff* by 10*ths*); which we ſhall endeavour to explain as clearly as poſſible. To proceed;

YOU ſee at once, that to abbreviate the *Diviſion* of 9000 *l.* with 80000 *l.* you muſt cut off *three Cyphers* from each *Sum*, and that *leaves* 9 *l.* to be *divided* by 80 *l.*

IF you place a *Cypher* after the 9 *l.* it will give 90 *Pieces* of 2 *Shillings*, which are here call'd (90 *Primes*), and are mark'd thus (′) over the *Cypher*.

IF you put *two Cyphers*, it will become 900 *Seconds*, of 2 ⅔ *d.* each, and which are mark'd with *two Accents* over the laſt *Cypher* in this manner (90́0́).

IF you add *three Cyphers*, it will become 9000 *Thirds* which are mark'd after this manner (90́0́0́;) and each of theſe *Thirds* is worth 6 . . . 25*ths* of a *Penny*.

IF you add *four Cyphers*, it will become 90000 *Fourths*, mark'd by *four Accents* over the laſt *Cypher*, or by IV; and each *Fourth* is worth 3 . . . 125*ths* of a *Penny*.

V

IF you add *five Cyphers*, it will become 900000 *Fifths*, which are mark'd by a V, and each *Fifth* is worth 3 . . . 1250*ths* of a *Penny*.

VI

IF you add *ſix Cyphers*, it will become 9000000 *Sixths*, which are mark'd by VI; and each *Sixth* is worth 3 . . . 12500*ths* of a *Penny*. This ſame Method muſt be follow'd, if you continue to add any more *Cyphers* to bring your *Anſwer* to a greater Exactneſs.

To begin then with our *Tariff* by *Tenths*; let us only put *four Cyphers* after the 9, which gives $\overset{IV}{90000}$ *Fourths*, to be *divided* by 80 *Pounds*, which is more eaſily perform'd, by cutting off the *Cypher* in the 80 *Pounds*, with a *Cypher* of the $\overset{IV}{90000}$ *Fourths*; for then you need only take the 8*th* Part of the 9000 *Fourths*. which gives 1125 *Fourths*, which he ought to have, that has 1 *l.* or 20 *s.* due.

Now ſince 1 *l.* brings . : . $\overset{IV}{1125}$ *Fourths*.
2 *l.* will bring . $\overset{IV}{2250}$ *Fourths*.
3 *l.* will bring . $\overset{IV}{3375}$ *Fourths*.
4 *l.* will bring . $\overset{IV}{4500}$
5 *l.* will bring . $\overset{IV}{5625}$
6 *l.* will bring . $\overset{IV}{6750}$
7 *l.* will bring . $\overset{IV}{7875}$
8 *l.* will bring . $\overset{IV}{9000}$
9 *l.* will bring $\overset{IV}{10125}$

To make uſe of this *Tariff*, you muſt reaſon thus: He, for Example, that has 60 *l.* due, ought to have ten Times as much, as he that has but 6 *Pounds* due; which being $\overset{\text{IV}}{6750}$, then he muſt have ten Times $\overset{\text{IV}}{6750}$, which is 67500 *Fourths*. He that has 66 *l.* due, by the ſame Reaſon muſt have 6750, and 67500 *Fourths*, which together make 74250 *Fourths*.

He that has 566 *l.* due, ſhould have 100 Times 5625 *Fourths*, which is 562500, and 74250 *Fourths*, more; and theſe two laſt *Sums* added together, make 636750 *Fourths*, that he ſhould have; and ſo for others.

But now the Buſineſs is, to find what theſe *Fourths* come to, and to turn them into *Pounds Shillings* and *Pence*, if there ſhould be any.

This is very eaſy; for if you cut off the *firſt four Figures* to the *Right-hand*, (as the Word *Fourths* denotes) all the others on the *Left-hand* will be *Pounds*; the *firſt Figure* after the *Separation*, denotes ſo many Pieces of two *Shillings*; the *ſecond* denotes Pieces of $2\frac{2}{5}$ *Pence*; and the *third* denotes Pieces of $\frac{6}{25}$ of a *Penny*, &c.

Seldom any Body gives himſelf the Trouble to find the Value of any *Figures* beſide the *firſt Three* after the *Separation*, becauſe they are of too little Conſequence; oftentimes they reckon only the *Primes*, and the *Seconds*, and for all the reſt they ſet down a *Penny* more, if they think proper.

But if you would know the Value of the *Remainder* exactly, multiply it by 20 (the *Shillings* in one *Pound*) and cut off the *firſt four Figures* to the *Right-hand*; what ſtands on the *Left-hand* are *Shillings*; then multiply the *Remainder* by 12, and cut off *four Figures* to the *Right-hand*, which gives the *Pence* on the *Left* of the *Separation*. You may multiply what remains after the *Pence* by 4 to find the *Farthings*, and ſo you may continue as far as you pleaſe to find any *Denomination* as ſmall as you deſire, as the 60*th* of a *Farthing*, or the 70*th*, &c.

Example.

WHAT is the Value of $63675\overset{\text{IV}}{0}$?

Operation.

Pounds	63	6750
		20
Shillings	13	5000
		12
Pence	6	0000 exact.

Anſwer. 63 *l.* 13 *s.* 6 *d.*

To illuſtrate this yet further, take the following

Examples.

		IV
l.	173	4897
		20
ſh.	9	7940
		12
d.	9	5280
		4
f.	2	1120

		V	
l.	7483	78437	*Fifths.*
		20	
ſh.	15	68740	
		12	
d.	8	24880	
		4	
f.	0	97520	
		60	
60*ths* of 1 *f.*	58	51200	

THUS for *Fifths* I cut off *five* Figures, for *Sixths* *ſix* Figures, *&c.* which is very eaſily remembred.

BUT to return to our *Queſtion*; for *Proof* you will find the 9000 *Pounds*, ſhared to the 80000 *Pounds*, by reaſoning after this Manner: 8 *Pounds* have 9000 *Fourths:* Then 80 *Pounds*, which are 10 times as much, will have 10 times $\overset{\text{IV}}{9000}$ *Fourths*: or $\overset{\text{IV}}{90000}$ *Fourths:* Then 800 *Pounds* will have 900000 *Fourths:* Then 8000 *Pounds* will have 9000000 *Fourths:* Then 80000 *Pounds* 90000000 *Fourths*; and cutting off the four laſt *Cyphers* of the 9000|$\overset{\text{IV}}{0000}$, as the Word *Fourths* denotes, there will remain 9000 *Pounds* before the *Separation* on the *Left-hand*, which is the *Proof*.

8 *Pounds* have	9000 *Fourths.*
80 *Ponnds* have	90,000 *Fourths.*
800 *Pounds* have	900,000 *Fourths.*
8000 *Pounds* have	9000,000 *Fourths.*
8000 *Pounds* have	9000,0000 *Fourths.*

Another Tariff *by Tenths.*

SUPPOSE a Diſtrict which paid *laſt Year* 8426 *Pounds*, is to pay *this Year* 12864; and it is requir'd to find, *How much* each Inhabitant is to pay, in Proportion to what he paid the *laſt Year*.

ADD 8 *Cyphers* to 8426, the *Sum* which they paid laſt Year, gives 842600000000 *Eighths*, which *divided* by the 12864 *Pounds* of this Year, will give in the *Quotient* 65500621, and there will remain 11456, which are ſo near *One*, that we ſhall make the laſt *Figure* of the *Quotient*, 2 inſtead of the 1, which it ſhould be.

Operation.

viii
12864) 842600000000 (65500621
77184

70760
64320

64400
64320

80000
77184

28160
25728

24320
12864

11456

Multiply the *Quotient*, which is the firſt *Line* here below, by 1, 2, 3, *&c.*

viii	
65500622	for 1 *l.*
131001244	for 2 *l.*
196501866	for 3 *l.*
262002488	for 4 *l.*
327503110	for 5 *l.*
393003732	for 6 *l.*
458504354	for 7 *l.*
524004976	for 8 *l.*
589505598	for 9 *l.*

For *Proof.* You muſt ſee if the 12864 *l.* will have the 8426, which were ſhared amongſt them by the *Diviſion* above: Therefore take

for 4	262002488
for 60	393003732.
for 800	524004976..
for 2000	131001244...
for 10000	65500622....
and for 12864 *Pounds* .	8426|00001408

THE *four Figures* before the *Separation*, are the true *Anſwer* in *Pounds*; and as for the *Figures* following, they are a Trifle too much, which proceeds from having made our *Fraction*, *One* in the Quotient; which if we had not done, the *Anſwer* would have been 8425|99985444. Now if you find the Value of this exactly by the Rule given in *Page* 243, it is 8425 *l.* 19 *s.* 11 *d.* 3 *f.* $\frac{81}{100}$ of a *Farthing*; but even in any Caſe you need but take *four Figures* after the *Separation*; that is, here if you take 9998, you will have 19 *s.* 11 *d.* 3 $\frac{13}{16}$ or $\frac{4}{5}$ *f.*

ALMOST all the *Rules* following are wrought by the *Rule of Three Direct*, but have different Names given them, according to the different Things they are applied to.

LOSS and GAIN.

BY this *Rule* we diſcover, at *what Price* we are to ſell our Goods, to *gain* or *loſe* ſo much *per Cent*.

Example. Suppoſe I have *Lace* that coſt me 5 *Pounds per Yard*; *How much* muſt I increaſe the *Price*, to *gain* juſt 8 *per Cent*.?

Anſwer. 8 *Shillings* per *Yard*.

Sum. If 100 *Pounds* gain 8 *Pounds*; what will 5 *Pounds* gain? *Anſ*. 8 *Shillings*.

Another Way. If 100 *Pounds* amount to 108 *Pounds*; what will 5 *Pounds* amount to?

Anſwer. 5 *Pounds* 8 *Shillings*.

Thus you ſee the *Lace* muſt be ſold at 5 *Pounds* 8 *Shillings per Yard*, to *gain* after the Rate of 8 *per Cent*.

Another Example. Suppoſe I buy 28 *Pieces* of Stuff at 4 *Pounds* per Piece; and I ſell 10 of the *Pieces* at 6 *Pounds*, and 8 *Pieces* at 5 *Pounds*; what muſt I ſell the other 10 *Pieces* at, to *gain* 10 *per Cent*. by the Whole?

10 *Pieces* ſold at 6 *l.* produce	60 *l.*
8 *Pieces* ſold at 5 *l.* produce	40 *l.*
So 18 *Pieces* ſold at diff. *Prices* produce	100 *l.*
The 28 *Pieces* at 4 *l.* coſt me	112 *l.*
which at 10 *per Cent.* Profit, bring	11 *l.* 4 *s.*
The 28 *Pieces* in all ſhould produce	123 *l.* 4 *s.*
But I have ſold 18 of the *Pieces*, which have produc'd	100 *l.*
Then the 10 other Pieces which remain, ſhould produce	23 *l.* 4 *s.*

Wherefore I ſay;

IF 10 *Pieces* ſhould produce 23 *l.* 4 *s.* *How much* 1?

Anſwer. 2 *Pounds* 6 *Shillings* 5 *Pence*, almoſt.

NOW, if inſtead of ſelling to Profit you were oblig'd to ſell to Loſs, you muſt work after the ſame Manner, ſaying; If *ſo much* loſes *ſo much*; How much does *ſo much*? Or elſe, if *ſo much* be reduc'd to *ſo much*; to what will *ſo much* be reduc'd? *&c.* This *Rule* is too eaſy to require any further *Explanation.*

TARE and TRET.

BY *Tare* is commonly meant the *Weight* of the *Cask*, *Cheſt*, or *Bag* in which *Goods* are put up; which when weighed ſeparately after the Goods are taken out, can occaſion no Difficulty: but for the moſt part they allow ſo much *Tare* to each *C. wt.* or 112 *lb. Groſs*; from which you may eaſily find how much *neat Weight* there is in any *Hogſhead*, &c.

Example.

IN 17 *C. wt.* 2 *Qrs.* 17 *lb. Groſs*; how much neat, allowing 10 *lb. Tare* to 1 *C. wt.*

Firſt Method.

REDUCE the *Groſs* Weight to *Pounds*, which makes 1977 *lb.* Then ſay; if 112 *lb.* give 10 *lb. Tare*, how much 1977. *Anſwer.* 176 $\frac{29}{56}$ *lb.* Then ſubtracting 176 $\frac{29}{56}$ from 1977, you have the *neat Weight* 1800 $\frac{27}{56}$ *lb.* which reduced to *C. wt.* makes 16 *C. wt.* 8 $\frac{27}{56}$ *lb.*

Second

Second Method.

SUBTRACT 10 *lb. Tare* from 112 *lb.* (the *Pounds* in *C. wt.*) it leaves 102 *lb.* Then ſay; if 112 *lb. Groſs* have 102 *lb. Neat,* how much *Neat* will 1977 *lb.* have? *Anſwer* 1800$\frac{27}{56}$ *lb.* as before.

Third Method.

CONSIDER what Part of 1 *C. wt.* the *Tare* is, and take out for it, as for any other Queſtion in *Aliquot Parts:* thus 8 *lb. Tare* is $\frac{1}{14}$ of 1 *C. wt.* and the 2 *lb.* (which remain of the 10 *lb. Tare*) is $\frac{1}{4}$ of 8 *lb.*

Operation.

	C. wt.	*Qrs.*	*lb.*	
The *Groſs Weight* is	17	2	17	at 10 *lb. Tare.*
$\frac{1}{14}$ of the Whole is	1	1	1$\frac{3}{14}$	for 8 *lb.*
$\frac{1}{4}$ of this is		1	7$\frac{17}{56}$	for 2 *lb.*
The whole *Tare* is	1	2	8$\frac{29}{56}$;	which taken
from the *Top,* leaves	16	0	8$\frac{27}{56}$	neat *Weight.*

SEE the Table of *Avoirdupois Weight,* Page 94.

SOMETIMES after they have taken out the *Tare*, they make another Allowance for *Waſte* which they call *Tret*: Then what remains after Deductions of the *Tare* is called *Subtle*, and what is left after *Tare* and *Tret* are deduced is called *Neat Weight*.

THE common Allowance for *Tret* is 4 *lb.* in 104, which is $\frac{1}{26}$ *Part*; ſo you need only find the *Subtle* as before ſhewn, and take the *Half*, and then the *Thirteenth* of this *Half*, which gives the *Tret*, and this taken from the *Subtle* leaves the *Neat*.

THUS, in the laſt *Example*, having found the *Neat*, which now we call the *Subtle*, I proceed thus.

Operation.

	C. wt.	*Qrs.*	*lb.*	
The *Subtle* is	16	0	8 $\frac{1}{2}$	of which
the *Half* is	8	0	8 $\frac{1}{4}$	and taking the
Thirteenth of this, *viz.*		2	13 $\frac{1}{2}$	
From the *Top*, leaves	15	1	23	*Neat Weight*.

WHEN they allow ſo much *Tret* to the *C. wt.* you muſt find it as you do the *Tare*; obſerving, that if it be but 4 or 5 *Pounds*, you may firſt take out for 16 *Pounds*, which is the $\frac{1}{7}$ of 1 *C. wt.* and afterwards out of the 16 *Pounds* take out for the *Tret*.

WE hope the Reader will not take it amiſs, that we have not all the Way hitherto, and that we ſhall not hereafter work all the Operations *of the* Rule of *Three, and other* Rules; *ſince our only Reaſon is, to prevent the Book being too large, and too dear; and eſpecially, ſince we think we have omitted nothing to give a full Underſtanding of four Fundamental Rules, both in whole Numbers, and Fractions, to which you may always have Recourſe for any* Operation *whatever, which you have to do; and we preſume it is ſufficient to have explain'd a Part of the foregoing and following* Sums, *and to ſet down their* Anſwers, *without working the* Operations *at large, as we did at the Beginning of this Book.*

BARTER.

BARTER.

WHEN *Merchants* or *Tradeſmen* exchange one Commodity for another, 'tis by the *Money*, or *Price* the Goods are worth, that they know what they have *gain'd* or *loſt*.

Example. Two Merchants *barter*; one hath *Dowlas* worth 48 *Shillings* the Piece, *ready Money*, but in *Barter* he values it at 50 *Shillings*; the other has *Scotch-Cloth* at 36 *Shillings* the *Piece*, *ready Money*; *How much* muſt he value it at in *Barter*, in Proportion to the other's valuing his *Dowlas*? Say, by the *Rule of Three*;

IF 48 *Shillings* ready Money, be worth 50 *Shillings* in *Barter*; *How much* are 36 *Shillings ready Money* worth? *Anſwer*. 37 *Shillings* 6 *Pence*.

TWO others alſo *barter*; the one has *Holland*, which he ſells at 60 *Pence per Ell*, *ready Money*, but in *Barter* he values it at 72 *Pence*; and alſo one *Fourth* of the *Money* down: The other has *Hops*, which he ſells at 3 *Pounds* 17 *Shillings per Cent. ready Money*; *How much* muſt he value his *Hops* at in *Barter*, that he may have the ſame *Gain* in Proportion as the other?

SUM

SUM.

THE *Holland* which is worth but 60 *Pence*, is valued at 72 *Pence*, of which he is to have one *Fourth* down, which is 18 *Pence* to be ſubtracted from the 70 *Pence ready Money*, as well as from the 72 *Pence* in *Barter*; thus

from 60 *d. ready Money*, and from 72 *d.* in *Barter*,
rebating 18 *d. ready Money*, and . 18 *d. ready Mo.*

leaves . 42 *d. ready Money*, or . 54 *d.* in *Barter.*

THEN if 42 *d. ready Money*, make 54 *d.* in *Barter*; *How much* will 77 *Shillings ready Money* make? *Anſw.* 99 *Shillings* in *Barter.*

THE Reaſon of our working this Sum after this Manner is, that he who receives one *Fourth* of his *Money down*, and may make uſe of it, ought not to have ſo great an Advantage in Proportion as the other.

BUT if theſe two Merchants had exchanged, the one his *Holland* of 60 *Pence per Ell* ready Money, after the Rate of 72 *Pence* in *Barter*; the other his *Hops* of 77 *Shillings* per *C. wt. ready Money*, after the Rate of 4 *Pounds* 5 *Shillings* in Barter; and it is required to tell which got or loſt by the Bargain; you muſt work as if you did not know what one of the two valued his Goods at in Barter. As for Inſtance, Suppoſe the *Hop-Merchant*; then ſay; If 60 *Pence* ready Money, make 72 *Pence* in Barter; *How much* muſt 77 *Shillings* make in Barter? *Anſw.* 4 *Pounds* 12 *Shillings* $4\frac{4}{5}$ *Pence*, which the *Hop-Merchant* ought to value his *Hops* at *per C. wt.* but he valuing them at no more than 4 *Pounds* 5 *Shillings*, he loſes 7 *Shillings* 4 $\frac{4}{5}$ *Pence per Cent.* which the other gains.

OTHERWISE, Suppoſe you did not know how much the *Linen-Draper* values his *Holland* at in *Barter*; then ſay; if 77 *Shillings* ready Money, make 85 *Shillings* in Barter; what will 60 *Pence* ready Money make? *Anſw.* 66 $\frac{18}{77}$ Pence, which the Holland of 60 *Pence*, ready Money, ought to be valued at in Barter, inſtead of being valued at 72 *Pence*, which is 5 $\frac{59}{77}$ Pence too much, which the ſaid *Draper* gains *per Ell*, by his *Holland*, and which the other thereby loſes.

IF neither one nor other of the Merchants which barter, ask more for their Goods in *Exchange*, than the ſelling Price for ready Money, there can be little Difficulty in working the *Exchange*, or Danger of being miſtaken: For you may immediately ſee by one Diviſion, how many *Ells* of *Holland* at 60 *Pence per Ell*, muſt be allow'd, for Example, for 300 *Pounds*, (if you would barter for that Sum) which are 1200 *Ells* of *Holland*, that the Hop-Merchant muſt receive. And dividing alſo 300 *Pounds* by 77 *Shillings*, you will have 77 $\frac{71}{77}$ or near 78 *C.* of *Hops*, which the *Draper* ſhould receive, in *Exchange* for his 1200 *Ells* of *Holland*.

INTEREST *at ſo much* per Cent. per Annum.

I. EXAMPLE. What is the *Simple Intereſt* of 300 *Pounds*, let out for 2 *Years*, after the Rate of 5 *per Cent. per Ann.?* Say; If 100 *Pounds* give 5 *per Cent.* Intereſt, for 1 Year; *How much* will 300 *Pounds* give? *Anſwer*, 15 *Pounds*: And if 1 *Year* brings in 15 *Pounds*; *How much* will 2 *Years*? *Anſwer*, 30 *Pounds*: Then joining the 30 *Pounds* Intereſt for the 2 *Years*, to the 300 *Pounds Principal*, gives 330 *Pounds*, to be paid for the *Principal* and *Intereſt*, at the End of the ſaid 2 *Years*.

II. *Example.* What is the *Sum Principal*, which in 2 *Years*, produces 30 *Pounds ſimple Intereſt*, after the Rate of 5 *per Cent. per Annum*? *Anſwer*, 300 *Pounds*.

Explanation. Firſt you ſuppoſe the Principal to be 100, which at 5 *per Cent. per Annum*, produces 10 Pounds *Intereſt* in 2 Years: Then ſay, If 10 *Pounds Intereſt* proceed from 100 *Pounds* the *Principal*, from *how much* do 30 *Pounds Intereſt* proceed? *Anſwer*, from 300 *Pounds*.

III. *Example.* How long muſt 300 *Pounds* be let out, after the Rate of 5 *per Cent. per Annum*, to bring in 330 *Pounds*, for the *Principal* and *Intereſt* together? *Anſ.* 2 *Years.*

To reſolve this and the like *Queſtions*, you muſt ſubtract the *Principal* (300 *Pounds*) from the *Principal* and *Intereſt* together, which gives the *Intereſt* ſeparate by itſelf: Then you may find what *Intereſt* the 300 Pounds *Principal* would produce in one *Year*, after the Rate of 5 *per Cent.* by ſaying; If 100 *Pounds* produce 5 *Pounds* in one *Year*; *How much* will 300 *Pounds* produce? *Anſwer*, 15 *Pounds*. And if 15 *Pounds* be the *Intereſt* of 1 *Year*; of *how long time* is 30 *Pounds*, the *Intereſt*? *Anſw.* 2 *Years.*

IV. *Example.* What is the ſeparate *Principal* of 330 *Pounds*, *Principal* and *Intereſt*, which is paid at the End of 2 *Years*, after the Rate of the 20th *Penny*? *Anſ.* 300 *Pounds.*

To work this *Queſtion*, and others of the ſame Sort, you take as many *Pounds*, as is the *Denomination* of the *Penny Intereſt*, which here is 20: then find what 20 *Pounds* amount to in the Time given at the 20*th Penny*; that is, in this *Example*, I find that 60 *Pounds* in 2 *Years*, at the 20*th Penny*, amount to 22 *Pounds*: Then ſay; If 22 *l.*—— from 20 *l.*—— from *what* 330? *Anſwer*, from 300 *Pounds.*

V. *Example.* A certain Perſon let out 300 *Pounds* to Intereſt, and at the End of 2 Years, he receives for *Principal* and *Intereſt*, 330 *Pounds*; after what *Rate* of *Intereſt* was it let out, *per Cent. per Annum*?

To reſolve this, and the like *Queſtions*, you muſt ſubtract 300 *Pounds* the *Principal*, from 330 *Pounds* the *Principal* and *Intereſt* join'd together, which leaves 30 *Pounds Intereſt*, ſeparate from the *Principal*: Then dividing the 30 *Pounds Intereſt* by 2 *Years*, you will have 15 *Pounds* the *Intereſt* for 1 *Year*; and all you have more to do, is to ſay; If 300 *Pounds* give 15 *Pounds Intereſt*, in one Year; *How much* do 100 *Pounds* give? *Anſwer*, 5 *Pounds*; or after the *Rate* of *five per Cent. per Annum*.

VI. *Example.* *How long* ſhould I be in receiving 330 *Pounds Intereſt*, at 15 *Pounds per Annum*? Say; If 15 *Pounds* be the *Intereſt* of 1 *Year*; in *how many Years* will the *Intereſt* amount to 330 *Pounds*? *Anſ.* 22 *Years*.

VII. *Example.* A certain Perſon ſold a *Houſe* for 1000 *l.* which he lett at 50 *l. per Annum*: The Queſtion is, *How many Years* Purchaſe it is ſold at?

You need but divide the *Sum* he ſold it for, by the *Rent* it brought him in; that is to ſay, 1000 *l.* by 50 *l.* and the *Quotient* 20, denotes it to be ſold at 20 *Years* Purchaſe.

VIII. *Example.* A certain Perſon having borrow'd 500 *Pounds*, after the Rate of the 30*th Penny*, upon Condition that he ſhall pay back 200 *Pounds* yearly; the *Queſtion* is, *How long* it will be before the *whole Debt* is diſcharg'd?

YOU muſt firſt find the *Intereſt* of 500 *Pounds*, after the Rate of the 30*th Penny* for one *Year*; which is found by dividing the 500 *Pounds* by 30, which gives 16 *Pounds* 13 *Shillings* 4 *Pence*; which added to the 500 *Pounds*, make 516 *Pounds* 13 *Shillings* 4 *Pence*, due at the End of the *firſt Year*; from which taking 200 *Pounds*, according to the Agreement, there remain 316 *Pounds* 13 *Shillings* 4 *Pence*, which he owes with its *Intereſt* at the End of the ſecond Year: Then divide the 316 *Pounds* 13 *Shillings* 4 *Pence*, by 30 again, and you'll have 10 *Pounds* 11 *Shillings* 1$\frac{1}{3}$ *Pence* the *Intereſt*; which added to the 316 *Pounds* 13 *Shillings* 4 *Pence*, makes 327 *Pounds* 4 *Shillings* 5$\frac{1}{3}$ *Pence*, due at the End of the *ſecond Year*; from which *Sum* ſubtracting the 200 *Pounds*, which he is to pay, and there remain 127 *Pounds* 4 *Shillings* 5$\frac{1}{3}$ *Pence* to be paid at the End of the *third Year*, with its *Intereſt*, which is 4 *Pounds* 4 *Shillings* 9$\frac{7}{9}$ *Pence*; and the Total will be 131 *Pounds* 9 *Shillings* 3$\frac{1}{9}$ *Pence*; which being paid at the End of the *third Year*, diſcharges the *whole Debt*. But if he is willing to pay before the Expiration of the *third Year*, then the *Intereſt* ſhould be computed for no longer Time, than to the *Day*, in which he completes the Payment of the *whole Debt*.

IX. *Example.* What is the *Simple Intereſt* of 900 *Pounds* forborn 6 *Years* 8 *Months* 5 *Days*, after the Rate of 12 *Pounds per Cent. per Annum*? Say, If 100 *Pounds* give 12 *Pounds Intereſt*, in one *Year*; *How much* will 900 *Pounds* give? *Anſwer*, 108 *Pounds*.

AND if 1 *Year* produces 108 *Pounds*; *How much* will 6 *Years* 8 *Months* 5 *Days* produce? Or elſe ſay; If 12 *Months* give 108 *Pounds*; *How much* will 80 $\frac{1}{6}$ *Months*?

Anſwer, 721 *Pounds* 10 *Shillings*.

X. *Example.* 1875 *Pounds* being paid for the Diſcharge of *three Sums* of Money, which brought in the like Intereſt, the *one* being let out at the 20*th Penny*, *another* at the 25*th Penny*, and the *other* at the 30*th Penny*; it is requir'd to tell, what is each particular *Sum*.

TO reſolve this Queſtion, you muſt add
the 25*th Penny*, or 25 *Years*,
with the 20*th Penny*, or 20 *Years*;
and with the 30*th Penny*, or 30 *Years*;

which gives the 75*th Penny*, or 75 *Years*.

THEN ſay; If 75 *Years* produce 1875 *Pounds*;
How much 25 *Years*?
How much 20 *Years*?
How much 30 *Years*?

And working the three Statings in the *Rule of Three*, after the uſual Method, you will have,

500 *l.* For the *Principal*, at the 20*th Penny*;
the *Intereſt* of which is 25 *l. per Ann.*
625 *l.* For the *Principal*, at the 25*th Penny*;
the *Intereſt* of which, is 25 *l. per Ann.*
750 *l.* For the *Principal*, at the 30*th Penny*;
the *Intereſt* of which, is 25 *l. per Ann.*

1875 *l.*

Which is found in dividing
500 *l.* by the 20*th Penny*;
625 *l.* by the 25*th Penny*;
and 750 *l.* by the 30*th Penny*.

Having the Rate *of* Intereſt per Cent. *given, to find what* Denomination *the* Penny *has: And, knowing the* Penny Intereſt, *to find* How much *that is* per Cent.

Example. What *Denomination* has the *Penny Intereſt*, that makes 5 *per Cent. per Annum?*

Anſwer. To find which, divide 100 by 5, gives the 20*th Penny*. For Proof, Say; *How much* doth the 20*th Penny* give *per Cent.?* And dividing 100 by 20, gives 5 *per Cent.* the *Anſwer*. Wherefore to lend or borrow Money after the Rate of the 20*th Penny*, is the ſame, as at 5 *per Cent. per Annum*.

WHAT *Denomination* has the *Penny Intereſt*, that gives 4 *per Cent.*? *Anſwer*, the 25*th Penny*; for divide 100 by 4, gives 25 in the *Quotient. How much per Cent.* is the 25*th Penny*? *Anſw.* 4. For divide 100 by 25, gives 4 in the *Quotient. How much per Cent.* is the 12*th Penny*? *Anſ.* 8 $\frac{1}{3}$, (or 8 *l.* 6 *s.* 8 *d.*) for divide 100 by 12, gives 8 $\frac{1}{3}$, and by 8 $\frac{1}{3}$ gives 12.

IF 100 *l.* after the Rate of the 12*th Penny*, produce 8 $\frac{1}{3}$ *Pounds*; *How much* 60 *l.*? *Anſ.* 5 *l.* If 100 *l.* produce 8 *l.* 6 *s.* 8 *d. How much* 60 *l. Anſ.* 5 *l.* &c.

THUS you ſee plainly, that the 12*th Penny*, and 8 $\frac{1}{3}$ *per Cent.* produce the ſame *Intereſt per Annum*: Wherefore you muſt always divide 100 by the *Penny Intereſt*, to find out, *How much per Cent.* is equal to it: And on the contrary, you muſt always divide 100 by *ſo much per Cent.* in order to find the *Penny Intereſt*, that is equal to it.

DISCOUNT.

BY this *Rule* you find how much you are to *rebate*, or *diminiſh* of a *Sum*, (upon paying it ſo much ſooner than you ought) after the Rate of ſo much *per Cent.* or to ſpeak more properly, after the Rate of *ſo much per Cent.* and *ſo much.* When we ſpeak then of the *Diſcount* of any Sum, you muſt underſtand the *Diminution*, that is to be made of it; ſince to *diſcount*, ſignifies to *diminiſh*, or *rebate*.

I. *Example.* A *Merchant* having bought 300 *Pounds* worth of Goods, upon Condition to pay for them a *Year* afterwards: The *Seller* comes within a Day or two, and tells him, that if he will pay him in ready Money, he will *rebate* or *diſcount* of the ſaid 300 *l.* after the Rate of 7 ½ *per Cent.* Wherefore it is required to tell, *How much* he muſt *rebate*, and the other is to *pay*.

ADD 7 ½ the *Diſcount* to 100, and then ſay, by the *Rule of Three*; If 107 ½ *Pounds* are *diminiſh'd* to 100; to what will 300 *l.* be *diminiſh'd*? *Anſ.* To 279 *l.* 1 *s.* 3 $\frac{32}{43}$ *d.* which the *Debtor* muſt pay *ready* Money.

FOR *Proof*, you muſt find what this ſaid *Debtor*, which pays ſo long before-hand gains, or what the *Debtor* loſes, ſaying; If in 107 *l.* 10 *s.* I gain 7 *l.* 10 *s.* *How much* in 300 *Pounds*? *Anſw.* 20 *l.* 18 *s.*

7 $\frac{11}{43}$ *d.* So the *Sum* when *diſcounted*, or *diminiſh'd*,
is . . . . 279 *l.* 1 *s.* 4 *d.* $\frac{32}{43}$
The *Sum* that is *rebated*, is 20 *l.* 18 *s.* 7 *d* $\frac{11}{43}$
And theſe two *Sums* added
together, make again 300 *l.* the *Proof.*

Another Proof.

IF the ſaid 279 *l.* 1 *s.* 4 $\frac{32}{43}$ *d.* be put to *Intereſt*, after the ſame Rate of 7 $\frac{1}{2}$ *per Cent. per Annum*, and you would find what the *Intereſt* is, you muſt ſay; If 100 *l.* give in one Year, 7 *l.* 10 *s.* *How much* 279 *l.* 1 *s.* 4 $\frac{32}{43}$ *d.*? And as 7 $\frac{1}{2}$ *per Cent.* is the ſame as the 13 $\frac{1}{3}$ *Penny*, you may alſo ſay; If 13 $\frac{1}{3}$, or if 13 *l.* 6 *s.* 8 *d.* give 1 *Pound Intereſt*; *How much* will 279 *l.* 1 *s.* 4 $\frac{32}{43}$ *d*? *Anſw.* 20 *l.* 18 *s.* 7 $\frac{11}{43}$ *d.*

THESE *two laſt* Proofs we have wrought, rather to give you a full Underſtanding of the *Rule*, than to be a *Proof*; for the *firſt Proof* is ſufficient, and is the eaſieſt of all *three.*

II. *Example.* PETER owes 500 *l.* to *James*, but need not pay him before 9 *Months* hence; but *James* tells *Peter*, that if he could pay him ſooner, he would *diſcount* to him of the 500 *l.* after the Rate of 10 *per Cent. per Annum.*

SIX *Months* after, *Peter* having Money enough, comes to pay *James*; the *Queſtion* is, *how much* he is to pay for the 500 *l.* which he owes; and *how much* he will *gain* by paying him 3 *Months* ſooner than he need to do?

To reſolve this, and all ſuch-like Queſtions; ſay; If for paying 12 *Months* ſooner, he *diſcounts* 10 *l. per Cent. How much* will *James*, upon my paying him 3 *Months* ſooner? *Anſw.* 2 *l.* 10 *s. per Cent.*

The ſtating of the Queſtion. If for 12 *Months* he *diſcounts* 10 *l. How much* for 3 *Months*? *Anſw.* 2 *l.* 10 *s.*

Then having found that *Peter* is to pay 2 *l.* 10 *s.* leſs *per Cent.* for the 3 *Months* he pays before-hand; there remains only to ſay, by the *Rule of Diſcount*; If for 102 *l.* 10 *s.* he pays but 100 *l. How much* is he to pay for 500 *l.*? *Anſw.* 487 *l.* 16 *s.* 1 $\frac{2}{41}$ *d.* For *Proof*, you muſt find what *Peter* gains by paying before-hand, and ſay, by another *Stating*; If in 132 *l.* 10 *s.* he gains 2 *l.* 10 *s* *How much* in 500 *Pounds*? *Anſ.* 12. *l.* 3 *s.* 10 $\frac{34}{41}$ *d.* which added to 487 *l.* 16 *s.* 1 $\frac{2}{41}$ *d.* makes 500 *l.* the *Proof*.

III. *Example* 300 *l.* are the *Principal* and *Intereſt* of a *Sum*, at the 20*th Penny*; what is the *Principal* and *Intereſt* thereof, ſeparately?

To find what the ſeparate *Principal* is, you muſt reaſon after this Manner; If 21 *l.* be the *Principal* and *Intereſt* for one Year, at the 20*th Penny*, that proceed from the *Principal* 20 *l.*; from what *Principal* come 300 *l*?

Stating. If 21 *l.* proceed from 20 *l.* from what do 330 *l.* proceed? *Anſ.* From 285 *l.* 14 *s.* 3 $\frac{3}{7}$ *d.*

To find the *Intereſt* ſeparately; ſay; If the ſeparate *Intereſt* of 21 *l.* for one *Year* be 1 *l.* what will be the ſeparate *Intereſt* of 300 *l.* alſo for one *Year*?

Stating. If 21 *l.* . . . . . . 1 *l.* *How much* 300 *l.*? *Anſw.* 14 *l.* 5 *s.* 8 4/7 *d.*

IV. *Example.* 500 *l.* being the *Principal* and *Duty* at 4 *Pence* per *Pound*; it is required to tell, what is the *Principal* and *Duty* ſeparately?

First bring the 1 *l.* or 20 *s.* into 240 *d.* to which add the 4 *d.* Duty, and then ſay; If 244 *d.* the *Principal* and *Duty*, proceed from 240 *d.* the *Principal*; from what do 500 *l.* proceed, which are the *Principal*, and *Duty*, at 4 *d.*? *Anſw.* From 491 *l.* 16 *s.* 0 48/61 of a *Penny*.

Stating. If 244 *d.* . . . . . 240 *d.* . . . . from what 500 *l.*?

And to find what the *Duty* at 4 *d.* *per Pound* comes to, ſay; If of 244 you *rebate* 4; *How much* of 500 *l.*? *Anſw.* 8 *l.* 3 *s.* 11 13/61 *d.* the *Duty* only; which taken from 500 *l.* leave 491 *l.* 16 *s.* 0 48/61 *d.* the *Principal*; which is a *Proof*.

V. *Example.* Having *preſent* Occaſion for Money, I take a *Bill* of *Exchange* of 500 *Pounds*, which I have, that is not yet due, and carry it to a *Banker*, to agree with him for the Value of it in *ready* Money; the Queſtion is, *How much* the *Banker* is to give me for it, *rebating* after the Rate of 2 *per Cent.*? Say;

If for 102 *l.* I receive but 100 *l.* *How much* ſhall I receive for 500 *l.* ? *Anſ.* 490 *l.* 3 *s.* 11 *d.* and $\frac{3}{51}$ of a *Penny*, for my *Bill* of *Exchange* not yet due.

For *Proof:* Find the *Diſcount*; ſaying; If out of 102 *l.* I loſe 2 *l.* *How much* ſhall I loſe out of 500? *Anſ.* 9 *l.* 16 *s.* 0 $\frac{48}{51}$ of a *Penny*; which with 490 *l.* 3 *s.* 11 $\frac{3}{51}$ *Pence*, which I receive preſent, make up again 500 *l.* in my *Bill* of *Exchange*.

Note: When 'tis ſaid, to *diſcount* 1 *per Cent.* it means, that you muſt rebate 1 out of 101, and not out of 100 only.

To *diſcount* at 2 *per C.* is to *rebate* 2 out of 102.
To *diſcount* at 3 *per C.* is to *rebate* 3 out of 103.
To *diſcount* at 4 *per C.* is to *rebate* 4 out of 104.
And not out of a *Hundred*; for in a large *Sum* that would make a conſiderable *Difference*.

Short Ways of working DISCOUNT.

You muſt note, that every *Queſtion* in Diſcount may be, and really is, *wrought* by the *Rule of Three Direct*.

Sometimes it is perform'd by a ſingle *Diviſion*; as when the *Queſtion* of the *Rule of Three* is *abbreviated*, and *reduc'd* to a ſingle *Diviſion*.

The two *firſt Terms* in all Queſtions of *Diſcount*, are to be conſider'd as a *Fraction*, of which the *firſt Term* is the *Undermoſt*, and the *ſecond* the *Uppermoſt*: Then *abbreviating* them one with the other, you will have the *Queſtion* of *Diſcount* abridg'd, after the ſame Manner, as when the *ſecond* Term in the *Rule of Three* is *abbreviated* with the *firſt*, and this *Abbreviation* will ſerve for all Sorts of *Sums*.

Example.

To *diſcount* 1 *per Cent.* Say; If 101 give 1; *How many*, &c. There is no *Abbreviation* here to be made, nor can there be any, becauſe you muſt always *divide* the *Sum* in the laſt Term by 101, to find how much is to be *rebated*.

To *diſcount* 1 ¼ *per Cent.* Say; If 101 ¼ give 1 ¼; *How many* ſo much? Having reduc'd theſe *two firſt* Terms into *Fourths*, they will be 405, and 5: Then taking the 5*th* of 405, and 5, you will have 81, the *Diviſor* of the *Sum*, which is to be *diſcounted*; which may be *divided* by 81, in taking the *Ninth Part* of the *Ninth*, becauſe 9 times 9, is 81.

To *diſcount* 2 *per Cent.* Say; If 102 give 2; *How many* ſo much? *Abbreviating* the 102, and 2, you'll have 51, for a *Diviſor* of the *Sum* to be *diſcounted*.

To *diſcount* 2 ½ *per Cent.* Say; If 102 ½ give 2 ½; *How many* ſo much? *Abbreviating* both theſe two *Sums*, after you have *reduc'd* them into 205 *Halves*, and 5 *Halves*, there will remain 41 of the 205, and 1 of the 5; but this 1 is of no Uſe, ſince it neither *multiplies* nor *divides*, and the 41 is the *Diviſor* of all the *Sum*, which is to be *diſcounted*, after the Rate of 2 ½ *per Cent.* whatever the *Sum be*.

To *diſcount* 4 *per Cent.*; Say; If 104 give 4; *How many* ſo much? After you have *abbreviated* theſe two *Terms*, by taking the *Fourth* of the one, and of the other; there remain 26 in the *firſt* for a *Diviſor* of all the *Sum* to be *diſcounted* at 4 *per Cent.* which may be *divided* by 26, in taking the *Thirteenth Part* of the *Half*, or the *Half* of the *Thirteenth*; for *twice* 13, or 13 times 2, is 26.

To *diſcount* 20 *per Cent.*; Say; If 120 give 20; *How many* will ſo much? *Abbreviating* them, there remain 6 in the firſt *Term*, for the *Diviſor* of all the *Sum* to be *diſcounted*, at 20 *per Cent.*

These *Examples* are ſufficient to make you perfectly conceive the Reaſon of the *Abbreviations* in *Diſcount*.

Since we have taught you the Way of *abbreviating Sums* of *Diſcount*, we ſhall now ſet down a little *Table* following, in which you may find all theſe *Abbreviations* formerly mentioned, and ſome others.

Abbreviations of DISCOUNT.

At 1 *per Cent.* you muſt *divide* the *Sum* to be *diſcounted* by 101, and you will have in the *Quotient*, what is to be *rebated* from the ſaid *Sum* to be *diſcounted*.

At 1 ¼ *per Cent.* it muſt be *divided* by . 81

At 2 *per Cent.* it muſt be *divided* by . . 51

At 2 ½ *per Cent.* it muſt be *divided* by . . 41

At 4 *per Cent.* by 26

At 5 *per Cent.* by : 21

At 6 *per Cent.* it muſt be *multiplied* by 3, and the *Product divided* by 53

At 7 ½ *per Cent.* it muſt be *mnltiplied* by 3, and the *Product divided* by . . . : 43

At 8 *per Cent.* you muſt *multiply* it by 2, and *divide* the *Product* by . . . : . 27

At 8 ⅓ *per Cent.* it muſt be *divided* by . 13

At 10 *per Cent.* you need only take the 11*th* of the *Sum* to be *diſcounted.*

At 12 *per Cent. multiply* by 3, and *divide* the *Product* by , ... 28

At 12 ½ *per Cent.* take out only the 9*th* of the *Sum* to be *diſcounted*, which gives what is to be *rebated.* The other *Abbreviations* in *Diſcount*, we ſhall not ſet down; but ſhall leave them to ſuch who may take a Pleaſure in finding them out themſelves, after the Manner we have above ſhew'd.

There are ſome who *diſcount* after the *Penny Intereſt*; and then they join always 1 (which is the *Intereſt* of 1 Year) to the *Penny*, whatever it be, provided it has no Fraction. So to diſcount after the Rate of the 20*th Penny*, you *divide* the *Sum*, which is to be *diſcounted* by 21; and the *Quotient* is the *Intereſt* of 1 Year, to be *rebated* from this *Sum*.

At the 21ſt *Penny*; *divide* by 22, taking the $\frac{1}{2}$ of the 11*th*.

At the 22*d Penny*; *divide* by 23.

At the 23*d Penny*; *divide* by 24, taking the 4*th* of the 6*th*.

At the 24*th Penny*; *divide* by 25, taking the 5*th* of the 5*th*.

At the 25*th Penny*; *divide* by 26. And ſo for all others: *dividing* always by 1 more than the *Penny Intereſt*, by which you are to *diſcount*.

These *Sums* may oftentimes be much more *abridg'd*, than they are here; according as the *Sum* to be *diſcounted* (which is the *Sum* to be *divided*) is apt to be *abbreviated* with its *Diviſor*.

COM-

COMPOUND INTEREST,

OR,

INTEREST upon INTEREST.

TO what comes the *Intereſt* of 100000 *l.* let out for 5 *Years*, after the Rate of the 10*th Penny*? *Intereſt upon Intereſt.*

FOR reſolving this, and the like *Queſtions*, you muſt draw up ſuch a *Table* as the following.

A Table to find the Intereſt *upon* Intereſt, *at the* 10*th* Penny, *or at* 10 per Cent. per Annum.

THE *Intereſt* of 100000 *l.* at the 10*th Penny*, for
1 *Year*, is 10000 *l.* which are to be added,
and the *Total* will be 110000 *l.* to be paid at the End
of the *firſt Year*. The *Intereſt* or 10*th Part*
. . . . of 110000 *l.*
(which muſt be added to it) is . . 11000 *l.*
And the whole that is to be paid at
the End of the *ſecond Year*, is . . 121000 *l.*
of which the 10*th Part*, or *Intereſt*, is 12100 *l.*
which being added together makes . 133100 *l.*
to be paid at the End of the *third Year*.
The 10*th Part* of which *Sum* is . . 13310 *l.*
which muſt be added to it, and makes 146410 *l.*
to be paid at the End of the *fourth Year*.
The *Intereſt* of which *Sum*, is . . . 14641 *l.*
which being added to it, makes . . 161051 *l.*
to be paid at the End of the *fifth Year*, &c.

FOR *Proof:* You muſt work the *Queſtion* back again, by asking, what is the *Sum Principal*, which in 5 *Years*, after the Rate of the 10*th Penny*, comes to 161051 *Pounds*, being the *Principal*, with the *Intereſt* upon *Intereſt*. Then to draw up the ſame *Table* back again, and to *ſubtract* the *Intereſt* from the *Principal*, you muſt add 1 to the 10*th Penny*, which gives 11, the *Part* you are to take, to find this *Diſcount*, and not the 10*th*.

From 161051 *l.* the *Prin.* and *Int.* for 5 *Years*. The 11*th* is 14641 *l.* the *Inter.* only; wᶜʰ

being taken from it, leaves 146410 *l.* *Prin.* and *Intereſt* for 4 *Years*.
the 11*th Part* of which, is 13310 *l.* the *Int.* only; wᶜʰ

being taken from it, leaves 133100 *l.* *Prin.* and *Intereſt* for 3 *Years*.
the 11*th Part* of which, is 12100 *l.* the *Int.* only; wᶜʰ

being taken from it, leaves 121000 *l.* *Prin.* and *Intereſt* for 2 *Years*.
the 11*th Part* of which, is 11000 *l.* the *Int.* only; wᶜʰ

being taken from it, leaves 110000 *l.* *Prin.* and *Intereſt* for 1 *Year*.
the 11*th Part* of which, is 10000 *l.* the *Int.* only; wᶜʰ

being ſubtracted, leaves 100000 *l.* the *Principal*, wᶜʰ is the *Anſwer*.

THIS is all one as if you ſhould ſay, A certain Perſon owes 161051 *Pounds*, which he is to pay 5 *Years* hence; but within a Day or two, his Creditor offers to *diſcount* or *rebate* the *Intereſt* upon *Intereſt*, after the Rate of 10 *per Cent. per Annum*, or the 10*th Penny*, (which is the ſame thing) provided he makes preſent Payment; the *Queſtion* is, *How much* he is to pay, if he accepts of this Propoſal. The *Anſwer* is, 100000 *l.* which he is to pay, and 61051 *l.* he would ſave by paying ſo long before-hand. According to theſe two Models you may draw up any *Tables*, not only for the 10*th Penny*, but for any other *Penny* whatever, and for what *Sums*; and as many *Years* as you may have Occaſion.

Equation of Payments.

BY this *Rule* you may find, at what *Time* ſeveral *Sums*, that are to be paid *ſeparately*, and at different *Times*, ſhould be brought into *one Payment*.

Example. Suppoſe I borrow 300 *l.* upon condition to pay
at the End of 2 *Mo.* $\frac{1}{3}$ of it, or 100 *l.* with the *Inter.*
at the End of 3 *Mo.* $\frac{1}{4}$ or 75 *l.* with the *Inter.*
at the End of 5 *Mo.* $\frac{1}{6}$ or 50 *l.* with the *Inter.*
at the End of 8 *Mo.* the *Remaind.* 75 *l.* with the *Inter.*

BUT finding myſelf the next Day able to diſcharge the whole *Debt* at *once;* I deſire to know when that muſt be done, that neither I, nor the Lender, may be any ways a Loſer, with reſpect to the *Intereſt* that becomes due.

Say ; 100 *l.* to be paid in 2 *Mo.* is 200 *l.*
75 *l.* to be paid in 3 *Mo.* is 225 *l.*
50 *l.* to be paid in 5 *Mo.* is 250 *l.*
and 75 *l.* to be paid in 8 *Mo.* is 600 *l.*

Total 300 *l.* to divide . . . . . 1275 *l.*

which gives the *Anſwer*, 4 *Months*, 7 $\frac{1}{2}$ *Days* ; at the End of which Time, the whole *Debt* muſt be paid at once.

Otherwiſe ſay ;

The $\frac{1}{3}$ of 2 *Mo.* is $\frac{2}{3}$ of 1 *Mo.* or 20 *Days.*
The $\frac{1}{4}$ of 3 *Mo.* is $\frac{3}{4}$ of 1 *Mo.* or 22 $\frac{1}{2}$ *Days.*
The $\frac{1}{6}$ of 5 *Mo.* is $\frac{5}{6}$ of 1 *Mo.* or 25 *Days.*
The $\frac{1}{4}$ of 8 *Mo.* is 2 *Months*, or 60 *Days.*

And you will have the ſame *Anſ.* 4 *Mo.* 7 $\frac{1}{2}$ *Days.*

THAT you may fully conceive the Reaſon of this *Sum*, ſuppoſe the ſaid 300 *Pounds* were lent me after the Rate of the 20*th Penny*, to be paid with the *Intereſt*, according to the different Times abovementioned.

IT is certain that 100 *Pounds*, after the Rate of the 20*th Penny*, give at the End of 1 *Year*, 100 *Shil.* or 5 *Pounds* ; and by conſequence 2 *Months*, which is the *6th Part* of 1 *Year*, produces the *6th Part* of 100 *Shillings*, which is . . . . 16 *s.* 8 *d.*
75 *Pounds* in 3 *Mo.* give . 18 *s.* 9 *d.*
50 *Pounds* in 5 *Mo.* give 1 *l.* 0 *s.* 10 *d.*
75 *Pounds* in 8 *Mo.* give 2 *l.* 10 *s.*

The whole *Intereſt* 5 *l.* 6 *s.* 3 *d.*

Now let us ſee if 300 *Pounds* in 4 *Months*, 7 ½ *Days*, give the ſame *Intereſt*, 5 *Pounds* 6 *Shillings* 3 *Pence*; which it muſt do, or elſe the *Sum* is falſe.

First of all, 300 *Pounds* at the 20*th Penny*, in one *Year*, give the *Intereſt* . . . . 300 *s.*

Then 4 *Mo.* will give the 3*d* Part of it,	100 *s.*
6 Days, which are the 5*th* Part of 1 *Mo.*	5 *s.*
1 ½ *Day*, which is ¼ of *6 Days*, gives	1 *s.* 3 *d.*

So 300.. at the 20*th Penny*, give 5 *l.* 6 *s.* 3 *d.* *Intereſt*, in 4 *Months*, 7 ½ *Days* as above; which proves that the *Sum* is right, and its Principles juſt; which being thoroughly underſtood, you will find no Difficulty; but on the contrary, it will be eaſily remembred, and practis'd.

Of

Of EXCHANGE.

BY this *Rule* we find, what we are to pay to a *Banker*, or *Tradeſman* in any City, after the Rate of *ſo much per Cent.* for a *Sum*, which he cauſes to be paid us in another City; where we are not willing to take the Trouble of carrying our Money, or running any Hazard of loſing it by the Way.

Example. Having ſome Buſineſs which calls me to *Briſtol*, where I ſhall want 1000 *l.* I apply myſelf to a *Banker*, and offer him 1 *per Cent.* Profit, upon *Exchange*, for his writing me a *Bill*, by which he ſhall order ſome Friend of his at *Briſtol*, to pay me the abovesaid *Sum* of 1000 *l.* upon the giving him the *Bill*.

THIS *Banker*, accepting of my Offer, furniſhes me with the ſaid *Bill* of 1000 *l.* which I pay him down upon the Spot; the *Queſtion* is, what I am to give him for the *Exchange* of this 1000 *l.*? I ſay by a *ſingle Rule of Three*; If for the *Exchange* of 100 *l.* I pay 1 *l.* *how much* muſt I pay for the *Exchange* of 1000 *l.*? *Anſ.* 10 *l.*

BUT ſuppoſe I had but 1000 *l.* in all, to give to the ſaid *Banker*, and I would know, *how much* Money I ſhould receive at *Briſtol*; I muſt ſay, by another *Rule of Three*, which is alſo called, the *Rule of Diſcount*, of which we have already treated; If for 101 *l.* I receive but 100 *l.* *how much* ſhould I receive for 1000 *l.*? *Anſw.* 990 *l.* 1 *s* 11 *d.* $\frac{77}{101}$ of a *Penny*; or ſay, 990 *l.* 2 *s.* for the 1000 *l.* which I paid at *London*.

IF I would remit my Money to *Paris*, *Madrid*, &c. or to any foreign *City*, there is another *Branch* of this *Rule*; *viz.* to find *how much* of the *Coin* of that *Country*, to which I want to remit my Money, *anſwers* to the *Sum* which I want to remit.

AN *Example* or two will make this *Branch* of *Exchange* plain to the meaneſt Capacity.

SUPPOSE I deſign to go into *France*, and want a *Bill* on ſome Perſon at *Paris* to the Value of 500 *l.* *Engliſh*; the *Queſtion* is, *how many Livres* muſt I receive at *Paris*, the preſent *Exchange* being 10 *Pence Engliſh* for one *Livre*? This is no more than to find how many *Pieces* of 10 *Pence* each there are in 500 *Pounds*.

I therefore reduce the 500 *Pounds* into *Pence*, which gives 120000 *Pence*; this divided by 10 *Pence*, the Value of one *Livre*, gives for *Anſwer* 12000 *Livres*.

ON the contrary, if my *Correſpondent* at *Paris* acquainted me by Letter, that he had ſold my Goods; and had receiv'd for them 12000 *Livres*; I want to know how many *Pounds Engliſh* I can receive in *London* for a Bill on my Friend to the Value of 12000 *Livres*, the *Exchange* being, as before, 10 *Pence per Livre*.

THIS is no more than to find the Value of 12000 *Pieces* at 10 *Pence* each; which I can eaſily do by *multiplying* the 12000 *Livres* by 10 *Pence*, which gives 120000 *Pence*; and bringing this into *Pounds*, it gives 500 *Pounds* for *Anſwer*.

IN *Exchange* to *Holland* and *Flanders*, they reckon by the *Pounds Flemiſh*, which is divided into *Shillings* and *Pence*, like the *Engliſh* Money; allowing ſo much *Flemiſh* to one *Pound Sterling*.

Example.

I WANT to remit to *Amſterdam* 137*l.* 17*s.* 8*d.* *Engliſh*: *How much Flemiſh* does this amount to, Exchange being at 32*s.* 6*d.* *Flemiſh*, to 1 *Pound Sterling*, or *Engliſh*.

AS every *Pound* muſt be increaſed to 1 *Pound* 12 *Shillings* and 6 *Pence*,

	l.	*s.*	*d.*	
I write	137	17	8	for the 1 *l.*
½ of which is	68	18	10	for 10 *s.*
and ⅕ of this is	13	15	9 ⅕	for 2 *s.*
of which ¼ is	3	8	11 6/20	for 6 *d.*
The *Tot.* is the *Anſ.*	224	1	2 ½	for 1 *l.* 12 *s.* 6 *d.*

IF I had 224 *Pounds* 1 *Shilling* and 2 *Pence Half-penny* due to me at *Amſterdam*; to find what it is worth at *London*, I muſt bring the 32 *Shillings* and 6 *Pence* (the preſent Value of one *Pound Sterling* in *Flemiſh* Money) into *Pence*; which makes 390 *Pence*;

and then ſay; If 390 *Pence Flemiſh*, are worth 240 *Pence Engliſh*, (there being 240 *Pence* in one *Pound*) *how much* are 224 *l.* 1 *s.* 2 ½ *d. Flemiſh* worth in *Engliſh Money*?

Abbreviating 390 with 240, I get 13 and 8: Therefore *multiplying* the *Sum* by 8, it gives 1792 *l.* 9 *s.* 8 *d.* to *divide* which by 13, I take the *Thirteenth* at once, which gives for *Anſwer* 137 *l.* 17 *s.* 8 *d.*

AFTER the ſame Manner, you may find *how much Spaniſh Money* is in any *Sum* of *Engliſh*, or how much *Engliſh* in any *Sum* of *Spaniſh*; if you know the preſent *Courſe* of *Exchange* betwixt *Spain* and *England*.

IF you underſtand theſe *Examples*, you will eaſily work any *Queſtion* in *Exchange*.

Of the Fineneſs *of* GOLD, *and* SILVER.

BEFORE we enter upon the Rules of ALLIGATION *Medial* and *Alternate*, it may not be improper to ſhew, how to find what *Fineneſs Gold* and *Silver* are of, when we know how much *Allay* there is to ſuch a *Quantity* of *pure Gold* or *Silver*; and on the contrary, to find the *Quantity* of *pure Gold* or *Silver* in any *Ingot*, when we know the *Degree* of *Fineneſs*.

YOU muſt remember, that (in Page 92*d*) we told you, that *Gold* and *Silver* are weighed by the *Troy-weight* ; of which 1 *Pound* weighs 12 *Ounces*, 1 *Ounce* 20 *Penny-weights*, and 1 *Penny-weight* 24 *Grains*.

BUT for the moſt part they reckon *Ounces* the higheſt *Denomination*, ſo that we ſeldom have any Uſe for *Pounds*. They ſay an *Ingot* weighs 400 *Ounces* of *Gold* or *Silver*, and not 33 *Pounds* 4 *Ounces* : Wherefore, in ſpeaking of *Gold* or *Silver* we ſhall expreſs the *Weight* in *Ounces*, *Penny-weights*, and *Grains*.

THE *Fineneſs* of *Gold* is expreſſed in *Carracts*, and Parts of a *Carract*, reckoning *pure Gold*, 24 *Carracts fine*.

WHEN we ſay *Gold* is 22 *Carracts fine*, we mean that there are 22 Parts of *pure Gold*, and the other 2 of *Copper*, or ſome other *Allay*; and this is the preſent *Standard* for Guineas and other *Gold Coin* in *England*.

WHEN we ſay *Gold* is 20 *Carracts fine*, we mean that there are 20 Parts of *pure Gold*, and 4 of *Allay*; always dividing the whole *Weight* into 24 equal Parts, and *however many* of theſe Parts are *pure Gold*, that *Ingot* or *Piece* is ſaid to be *ſo many Carracts fine*.

WHEN *Gold* is 21 *Carracts fine*, it is ſaid to be 1 *Carract worſe* than *Standard*, which (as we have ſaid before) is 22 *Carracts fine*: When *Gold* is 20 *Carracts fine*, it is called 2 *Carracts worſe* than *Standard*.

AFTER the ſame Manner, if *Gold* be 23 *Carracts fine*, it is ſaid to be 1 *Carract better* than *Standard*, and ſo of the other *Carracts*; always reckoning it ſo many *Carracts better* or *worſe* than *Standard*, as it exceeds or comes ſhort of 22 *Carracts*, which is the *Standard*.

THE *Fineneſs* of *Silver* is eſtimated by *Ounces* and *Penny-weights*, in this Manner: They always make a *Pound Troy* the *Integer*, and however many *Ounces* and *Penny-weights* of *pure Silver* there are in a *Pound* of the *Mixture*, that *Mixture* is ſaid to be ſo many *Ounces* and *Penny-weights* fine.

IF there are 11 *Ounces* 2 *Penny-weights* of *fine Silver*, and the other 18 *Penny-weights Copper*, or any other *Allay*; then this *Silver* is ſaid to be 11 *Ounces* 2 *Penny-weights fine*; and this is the preſent *Standard* for *Silver Coin* in *England*.

If there are 11 *Ounces* 6 *Penny-weights* of *fine Silver*, and only 14 *Penny-weights* of *Copper*, or *Allay*; then the *Silver* is called 11 *Ounces* 6 *Penny-weights fine*, or 4 *Penny-weights better* than *Standard*, and ſo of any other Proportion.

Whatever *Weight* there is of the *Silver*, whether 400 *Ounces*, or only 1 *Ounce*, they reckon the *Fineneſs* always by the Proportion betwixt the *pure Silver* and *Allay* in one Pound *Troy*: So when I ſay, that an *Ingot* of *Silver* weighs 117 *Ounces* 13 *Penny-weights*, and is 11 *Ounces* 1 *Penny-weight fine*; the 117 *Ounces* &c. is the Weight of the *Ingot*, and the 11 *Ounces* 1 *Penny-weight* is the Quantity of *pure Silver* in one Pound of that *Ingot*. Wherefore, you muſt always carefully diſtinguiſh between the *Ounces* and *Penny-weights* which expreſs the *Weight*, and *thoſe* which expreſs the *Degree* of *Fineneſs*.

This being premiſed, I ſhall ſhew in a few *Examples*, how you may work any *Queſtion*, which can happen concerning the *Fineneſs* of *Gold* or *Silver*.

I. *Example.*

If I mix 181 *Ounces* of *pure Gold*, with 11 *Ounces* of *Copper*; what *Degree* of *Fineneſs* will the *Mixture* be of?

You muſt add the 11 *Ounces* to the 181 *Ounces*, which make 192 *Ounces*; then if 192 *Ounces Mixture* give 181 *Ounces pure Gold*; *what will* 24 *Carracts* give?

Abbreviating the 192 with the 24, gives 8 for a *Diviſor*; by which *dividing* 181 gives the *Quotient* $22\frac{5}{8}$ *Carracts* for the *Anſwer*.

Now, as the Goldſmiths call the *Fourth* of a *Carract*, a *Grain* of a *Carract*, if you multiply the *Remainder* by 4 *Grains* in a *Carract*, and continue the *Diviſion*, you will find the *Anſwer* 22 *Carracts*, 2 ½ *Grains*.

II. *Example.*

Suppose I mix 181 *Ounces pure Silver* with 11 *Ounces Copper*, what is the *Degree* of *Fineneſs* of the *Mixture* ?

Having added the 181 to the 11, it gives 192 *Ounces:* Then ſay, if 192 *Ounces* of *Mixture* have 181 *Ounces* of *pure Silver*; *how much* have 12 *Ounces* ?

I *abbreviate* the 192 with the 12, which gives 16 for the *Diviſor* ; and dividing 181 by 16, I have 11 in the *Quotient*, and 5 for a *Remainder* ; which *multiplied* by 20 *Penny-weights*, gives 100 *Penny-weights*, to be *divided* by 16 ; and *dividing* it, gives 8 in the *Quotient*, and 4 for the *Remainder*, which is ¼ of a *Penny-weight*, or 6 *Grains*. The *Anſwer* is 11 *Ounces* 8 *Penny-weights* 6 *Grains*.

III. *Example.*

An *Ingot* of *Gold* weighs 145 *Ounces* 15 *Penny-weights* 10 *Grains*, being 22 *Carracts fine* ; the *Queſtion* is, how much *pure Gold* is in the *Ingot* ?

One *Method* of working this *Queſtion* is, to reduce the whole into *Grains*, which gives 69970 *Grains*. Then ſay; if 24 give 22, what will 69970 give? *Anſwer*, 64139 ⅙ *Grains*; which brought into *Ounces*, *Penny-*

Penny-weights, and *Grains*, gives 133 *Ounces* 12 *Penny-weights* 11 $\frac{1}{6}$ *Grains pure Gold.*

ANOTHER *Method* is to find the *Allay*, and having ſubtracted it from the *Weight* given, you have the *Quantity* of *pure Gold.*

THUS in this *Example*, having reduced the whole into *Grains* ; Say ; if 24 *Carracts* have 2 *Carracts Allay*, how much will 69970 *Grains* have? *Anſwer* 5820 $\frac{5}{6}$ *Grains*, which make 12 *Ounces* 2 *Penny-weights* 12 $\frac{5}{6}$ *Grains*.

THEN ſubtracting this from 145 *Ounces* 15 *Penny-weights* 10 *Grains*,' there remain of *pure Gold* 133 *Ounces* 12 *Penny-weights* 11 $\frac{1}{6}$ *Grains*, as before.

BUT in all Caſes where the *two firſt Terms* can be *abbreviated*, (as here) it is needleſs to reduce the *Weight* into the ſmalleſt *Denomination* : for by *abbreviating* 24 with 22, I have 12 and 11 ; ſo I can multiply the 145 *Ounces* 15 *Penny-weights* 10 *Grains*, at once by 11, which gives 1603 *Ounces* 9 *Penny-weights* 14 *Grains* ; of which taking the *Twelfth* at once, I have 133 *Ounces* 12 *Penny-weights* 11 $\frac{1}{6}$ *Grains.* After the ſame Manner I may find the *Allay* by taking the *Twelfth* at once, without reducing the Weight into *Grains*.

THERE is another Method, which is a little longer than the former in working this *Example*; but which is by far the *eaſieſt*, when there are any *Fractions* of a *Carract* ; *viz.* to take out for the *Carracts*, and *Grains* of a *Carract*, conſidering them as *Fractions* of 24 *Carracts* ; as you ſee done in the following *Operation*.

	Oz.	P. *wt.*	Gr.	Car.
The *Weight* is	145	15	10 being	22 *fine*.
I take $\frac{1}{2}$ which is	72	17	17 for the	12 *Car*.
and $\frac{1}{2}$ of this is	36	8	20 $\frac{1}{2}$ for the	6 *Car*.
and $\frac{1}{3}$ of the 12 *Car*. is	24	5	21 $\frac{2}{3}$ for the	4 *Car*.
The Sum is	133	12	11 $\frac{1}{6}$ for the	22 *C*.

OR if you chuſe to find the *Allay*, you may proceed in this Manner.

	Oz.	P. *wt.*	Gr.
The *Weight* is	145	15	10 at 2 *Car*. *Allay*:
$\frac{1}{12}$ of which is	12	2	22 $\frac{5}{6}$ for the *Allay*.
And there remain	133	12	11 $\frac{1}{6}$ as before.

I ſhall only give one *Example* more, which is one of the moſt difficult that can happen in this *Rule*.

IV. *Example*.

IV. *Example.*

An *Ingot* of *Gold* weighs 117 *Ounces* 13 *Penny-weights* 17 *Grains*, and is 22 *Carracts* 2 *Grains* and $\frac{1}{4}$ of a *Grain fine*, to find the Quantity of *pure Gold*.

	Oz.	*P.wt.*	*Gr.*	
The *Weight* is	117	13	17	at 22 *Car.* 2 $\frac{1}{4}$ *Gr.*
I take $\frac{1}{2}$ which is	58	16	20 $\frac{1}{2}$	for 12 *Car.*
$\frac{1}{2}$ of which is	29	8	10 $\frac{1}{4}$	for 6 *Car.*
$\frac{1}{3}$ of which is	9	16	3 $\frac{5}{12}$	for 2 *Car.*
which I repeat	9	16	3 $\frac{5}{12}$	for 2 *Car.*
$\frac{1}{4}$ of which is	2	9	0 $\frac{10}{12}$	for 2 *Gr.*
and $\frac{1}{8}$ of this is		6	3 $\frac{1}{12}$	for $\frac{1}{4}$ *Gr.*
The *Sum* is	110	12	17 $\frac{1}{2}$	for 22 *Car.* 2 $\frac{1}{4}$ *G.*

By the ſame Method you may find the *Allay* in the *Ingot*; for ſubtracting 22 *Carracts* 2 $\frac{1}{4}$ *Grains* from 24 *Carracts*, there remains 1 *Carract* 1 $\frac{3}{4}$ *Grain*; which we take out for, in the following Manner.

	Oz.	*P.wt.*	*Gr.*	
The *Weight* is	117	13	17	at 1 *Car.* 1 $\frac{3}{4}$ *Grain.*
$\frac{1}{12}$ of the *Weight* is	9	16	3 $\frac{5}{12}$	for 2 *Car.*
$\frac{1}{2}$ of which is	4	18	1 $\frac{17}{24}$	for 1 *Car.*
and $\frac{1}{2}$ of this gives	1	4	12 $\frac{10}{24}$	for 1 *Gr.*
of which $\frac{1}{2}$ is		12	6 $\frac{5}{24}$	for $\frac{2}{4}$ *Gr.*
and laſtly, $\frac{1}{2}$ of this is		6	3 $\frac{2}{24}$	for $\frac{1}{4}$ *Gr.*
The *Anſwer* is	7	10	23 $\frac{11}{24}$	for 1 *Car.* 1 $\frac{3}{4}$ *Gr.*
wch ſubtracted from the firſt *Line*, gives	110	12	17 $\frac{11}{24}$	*pure Gold.*

Here, in adding up the *24ths*, I reckon the *Sum* one more than it really is, becauſe in the *Diviſion* there was a ſmall *Remainder* in taking out for 1 *Carract*, and alſo in taking out for $\frac{1}{4}$ *Grain* :- And as there was likewiſe a ſmall *Remainder* in the two laſt Lines of the former *Operation*, when we took out for the 22 *Carracts* 2 $\frac{1}{4}$ *Grains*, the Difference betwixt the two *Anſwers* is leſs than the 24*th Part* of a *Grain*, which is altogether inconſiderable.

Observe alſo, that after I had once got a *Fraction* with 24 for the *Undermoſt*, I choſe rather to expreſs the following *Fractions* with the ſame *Undermoſt*, than to reduce them back to their *loweſt Terms*; thus I ſet down $\frac{10}{24}$ rather than $\frac{5}{12}$, becauſe in adding them up they muſt be all reckon'd by 24*ths*, ſince one of them is ſo.

V. *Example.*

V. *Example.*

AN *Ingot* of *Silver* weighs 145 *Ounces* 15 *Penny-weights* 10 *Grains*, being 10 *Ounces* 17 *Penny-weights* 12 *Grains* fine; how much *fine Silver* is there in it?

	Oz.	*p. w.*	*gr.*		*Oz.*	*p. w.*	*gr.*
The *Weight* is	145 :	15 :	10	at	10 :	17 :	12
$\frac{1}{2}$ of the *whole* is	72 :	17 :	17	for 6 *oz.*			
$\frac{1}{3}$ of the *whole* is	48 :	11 :	19 $\frac{1}{3}$	for 4 *oz.*			
$\frac{1}{8}$ of which gives	6 :	1 :	11 $\frac{5}{12}$	for 10 *p. w.*			
$\frac{1}{2}$ of this gives	3 :	0 :	17 $\frac{17}{24}$	for 5 *p. w.*			
and laſtly, $\frac{1}{2}$ of this is	1 :	10 :	8 $\frac{20}{24}$	for 2 *p. w.* 12 *gr.*			
Total of *fine Silv.*	132 :	2 :	2 $\frac{1}{24}$	for 10 *oz.* 17 *p. w.* (and 12 *gr.*			

OR you may find the *Allay* firſt, by ſubtracting 10 *Ounces* 17 *Penny-weights* 12 *Grains*, from 1 *Pound* or 12 *Ounces Troy*: You get 1 *Ounce* 2 *Penny-weights* 12 *Grains* for the *Allay* in 1 *Pound Troy*.

Then

	Oz.	*p.w.*	*gr.*		Oz.	*p.w.*	*gr.*
Then ſet down	145 :	15 :	10	at	1 :	2 :	12
of the *Weight* is	12 :	2 :	22 5/6	for	1 *oz.*		
1/8 of which gives	1 :	10 :	8 5/6	for	2 *p.w.*	12 *gr.*	
Total of the *Allay is*	13 :	13 :	7 2/3;	which, taken from			
the whole, leaves	132 :	2 :	2 1/3	*pure Silver.*			

BEFORE I finiſh this Rule, I ſhall ſhew how to find the *Price* of any *Ingot* of *Gold* or *Silver*, at ſo much *per Ounce*, by two very eaſy *Methods.*

First Example.

WHAT is the *Value* of 133 *Ounces* 12 *Penny-weights* 11 1/6 *Grains* of *Silver*, at 5 *Shillings* 6 1/2 *Pence per Ounce?*

First Method.

FIND the *Value* of the 133 *Ounces* at 5 *s.* 6 1/2 *d.* then take out for the 12 *Penny-weights* 11 1/6 *Grains* from 5 *s.* 6 1/2 *d.* which is the *Price* of one *Ounce*; thus:

Oz. p.w. gr. *s. d.*
133 : 12 : 11 $\frac{1}{6}$ at 5 : 6 $\frac{1}{2}$ *p. oz.*

$\frac{1}{4}$ of 133 is	33 *l.*	15 *s.*		for 5 *Shillings.*
$\frac{1}{10}$ of which is,	3 *l.*	6 *s.*	6 *d.*	for 6 *Pence.*
of which $\frac{1}{12}$ is		5 *s.*	6 $\frac{1}{2}$ *d.*	for $\frac{1}{2}$ *Penny.*
$\frac{1}{2}$ of 5 *s.* 6 $\frac{1}{2}$ *d.* is		2 *s.*	9 $\frac{1}{4}$ *d.*	for 10 *p. w.*
of which $\frac{1}{4}$ is			8 $\frac{1}{4}$	for 2 *p. w.* 12 *gr.*
The *Total* is	37 *l.*	0 *s.*	6 *d.*	the *Anſwer.*

N. B. For 11 $\frac{1}{6}$ *Grains* I have reckoned 12 *Grains*, which makes no Difference, ſince 5 *Sixths* of a *Grain* do not amount to one *Half* of a *Farthing*, when the *Price* of the *Ounce* is under 6 *Shillings*; or, in other Words, you may always neglect any *Fractions* of a *Grain*, in finding the Price of *Silver*: But we muſt make ſome Allowance in Queſtions concerning the Price of *Gold*, as will be ſhewn preſently.

Second Method.

SINCE an *Ounce* contains 20 *Penny-weights*, and 1 *Penny-weight* weighs 24 *Grains*; we may ſet down the *Ounces* and *Penny-weights*, as if they were *Pounds* and *Shillings*; and for the *Grains* ſet down *half* as many *Pence*; if there be any *Fractions* of a *Grain*, you may alſo take the *Half* of it, and ſet after the *Pence*: Then take out for the *Price* as uſual. Thus if we take the ſame *Example*; for 133 *Ounces* 12 *Penny-*

Penny-weights, I write 133 *Pounds* 12 *Shillings*; and, for 11 $\frac{1}{6}$ *Grains*, I write 5 $\frac{7}{12}$ *Pence* : Then I proceed in this Manner.

	l:	*s*.	*d*.		*s*. *d*.
I TAKE $\frac{1}{4}$ of	133 :	12 :	5 $\frac{1}{12}$	at	5 6 $\frac{1}{2}$
which gives	33 :	8 :	1 $\frac{1}{2}$	for	5 *Shil.*
$\frac{1}{10}$ of which is	3 :	6 :	9 $\frac{3}{4}$	for	. 6 *Pence.*
$\frac{1}{12}$ of which is		5 :	6 $\frac{3}{4}$	for	. . $\frac{1}{2}$ *Penny.*
The *Total* is	37 :	0 :	6	as before.	

Second Example.

WHAT is the *Value* of 133 *Ounces* 12 *Penny-weights* 11 $\frac{1}{6}$ *Grains* of *Gold*, at 3 *l.* 17 *s.* 9 *d.* per *Ounce* ?

First Method.

	Oz.	*p.w.*	*gr.*		*l.*	*s.*	*d.*
I multiply the *Ounces* by	133 :	12 :	11 $\frac{1}{6}$	at	3 :	17 :	9 *p. oz.*
	3 *l.*						

which gives	399 *l.*	for 3 *l.* which is 60 *s.*
$\frac{1}{4}$ of this is	99 *l.* 15 *s.*	for 15 *s.*
and $\frac{1}{6}$ of this is	16 *l.* 12 *s.* 6 *d.*	for 2 *s.* 6 *d.*
and $\frac{1}{10}$ of this is	1 *l.* 13 *s.* 3 *d.*	for 3 *d.*
$\frac{1}{2}$ of one *Oz.* is	1 *l.* 18 *s.* 10 $\frac{1}{2}$ *d.*	for 10 *p. w.*
and $\frac{1}{4}$ of this is	9 *s.* 8 $\frac{1}{2}$ *d.*	for 2 $\frac{1}{2}$ *p. w.*
The *Total* is	519 *l.* 9 *s.* 4 *d.*	

BUT this is ſomething too much, ſince we have taken out for 12 *Grains*, inſtead of 11 $\frac{1}{6}$; therefore, for the $\frac{1}{6}$ of a *Grain* I ſubtract *three Halfpence*; the *Remainder* gives the *Anſwer* true to a *Farthing*, viz. 519 *l.* 9 *s.* 2 $\frac{1}{2}$ *d.*

Second Method.

I SET down the *Ounces* and *Penny-weights* as *Pounds* and *Shillings*, and take $\frac{1}{2}$ of the *Grains*, which I call *Pence*; and I take out for the 3 *l.* 17 *s.* 9 *d.* thus:

	l.	*s.*	*d.*		*l.*	*s.*	*d.*
I multiply	133 :	12 :	5 $\frac{7}{12}$	at	3 :	17 :	9
by			3				
which gives	400 :	17 :	4 $\frac{3}{4}$	for	3 *Pounds.*		
$\frac{1}{4}$ of which is	100 :	4 :	4 $\frac{3}{16}$	for	.	15 *Shil.*	
$\frac{1}{6}$ of this gives	16 :	14 :	0 $\frac{11}{16}$	for	:	2 *s.*	6 *d.*
and $\frac{1}{10}$ of this	1 :	13 :	4 $\frac{14}{16}$	for .	.	.	3 *d.*
The *Anſ.* is	519 :	9 :	2 $\frac{1}{2}$	for	3 *l.*	17 *s.*	9 *d.*

THIS is ſo eaſy as to need no further Explanation: I ſhall only add, that the Reaſon of my ſubtracting *three Half-pence* in the firſt *Method* of working this *Example*, was; that a *Grain* of *Gold* is exactly worth 2 *Pence*, when the *Ounce* is 4 *Pounds*; and conſequently $\frac{5}{6}$ of a *Grain* are worth about 3 *Half-pence*, ſince a few *Shillings* in the Value of an *Ounce* make no Difference in the Value of one *Grain*.

Alligation Medial.

THIS *Rule* teacheth us to find the *Value* of any *Mixture*; when we know the *Quantity* and *Price* of the *ſeveral Parts*, which compoſe it.

TO do this, you need only conſider, that by adding up the *Quantities* of the *ſeveral Parts*, (whether *Quarters* or *Pounds*, &c.) you find the *Quantity* contained in the *whole Mixture*; and in like manner, by adding up the *Prices* of the ſeveral *Parts*, you find the *Price* or *Value* of the Whole: Then *divide* the whole *Price* by the *Number* of *Pounds*, *Quarters*, &c. contained in the *whole Mixture*; and the *Quotient* is the *Price* or *Value* of one *Pound*, *Quarter*, &c. of the *Mixture*.

IF the *Number* of *Pounds*, *Quarters*, &c. be equal in *each Parcel*; you need only take the *Price* of one of *each Sort*, and (having added them together) *divide* their Sum by the *Number* of *Parcels* or Sorts: This gives you the *Price* of one *Pound*, *Quarter*, &c. of the *Mixture*.

THIS will be eaſily learnt from the following *Examples*.

Firſt Example.

A certain Perſon mixes

12 *Qrs.* of *Wheat* at 20 *s.* { *How much* is
with 12 *Qrs.* of *Rye* at 15 *s.* { 1 *Qr.* of this
and with 12 *Qrs.* of *Barley at* 13 *s.* { *Mixture* worth?

The 3*d Part* of . . 48 *s.* is 16 *Shillings*

---

per *Quarter*, the *Anſwer*; becauſe there is as much of one Sort as of another in the Mixture.

IF there had been but two Sorts, you ſhould have taken the *Half*, as you now take the *Third*, becauſe there are *three* Sorts; if there had been *four* Sorts, you ſhould have taken the *Fourth*; if there were *five*, you ſhould have taken the *Fifth*; and ſo on; provided the Quantity of each Sort be alike.

Second Example.

A CERTAIN Perſon would mix *Wines* at 4, at 6, at 8, and at 10 *Shillings* the *Gallon*, of each *Sort* an *equal Quantity*; the Queſtion is, *How much* one *Gallon* is worth?

SINCE the *Difference* of the *Price* is all the Way the ſame, you need but add the firſt *Price* 4 *s.* with the laſt *Price* 10 *s.* which is 14 *s.* the *Half* of which is 7 *s. per* Gallon, the *Anſwer*.

THIS *Method* holds good, when the *Prices* of the *ſeveral Sorts* increaſe equally, (as *here*, 4, 6, 8, 10) and an equal *Quantity* is taken of *each Sort*. Of this take another *Example*.

Third Example.

A *Silverſmith* has *Silver* of 7, of 8, of 9, of 10, and of 11 *Ounces fine*, an equal Quantity of which he melts down together; the *Queſtion* is, of what *Fineneſs* the Mixture will be?

ADDING 7 and 11 together, makes 18, the *Half* of which is 9 *Ounces*, the *Anſwer*.

BUT if you put more of one Sort than of another into this Mixture, then you muſt multiply each particular Quantity into the Value of one in each Sort.

Fourth Example.

SUPPOSE I melt together the following Quantities of *Silver*, viz.

lb.		*oz. fine.*		*pure Silver.*	
6	of	11	which make	66 *oz.*	What is the *Degree* of *Fineneſs* of the Whole?
4		10 $\frac{1}{2}$		42 *oz.*	
7		10		70 *oz.*	
8		9		72 *oz.*	

IF 25 *lbs.* have of *pure Silv.* 250 *oz.* how much 1 *lb*?

Anſwer, 10 *oz.* The Whole will be 10 *oz.* fine.

Fifth Example.

A Perſon has Gold to melt, of 16, 18, 19, and 20 *Carracts fine*, and he puts in

3 *oz.* at 16 *Car.* w^{ch} make 48 *Car.*
5 . at 18 *Car.* . . 90 *Car.*
2 . at 19 *Car.* . . 38 *Car.*
2 . at 20 *Car.* . . 40 *Car.*
If 12 *oz.* contain . . 216 *Car.*

The Queſtion is, what Degree of *Fineneſs* theſe 12 *oz.* will be of, when they are all melted together?

How much 1? *Anſwer*, 18 *Car.*

Sixth Example.

Another would put into the Foundary, and mix
12 *lbs.* of *Sil.* of 11 *oz. fine*, w^{ch} make 132 *oz.* and
4 *lbs.* of *Cop.* of 0 *oz. fine* . . . 0 *oz.*

If 16 *lbs.* together contain . . . . 132 *oz.*
How much 1? *Anſwer*, 8 *Ounces*, 5 *p. wts.*

The *Copper* is not multiplied by any thing, ſince it brings no *Degree* of *Fineneſs* to the *Mixture*, but only adds to the Weight; and of Conſequence muſt diminiſh the *Quantity* of *fine Silver* in each *Ounce* of the Maſs, after it is melted together with the other *Silver*.

After the ſame Manner may all *Queſtions* whatſoever be wrought, which belong to this Rule; wherefore we ſhall not give any more *Examples*, but proceed to the next *Rule*.

Alligation

Alligation Alternate.

By the Common Method.

THIS *Rule* is the Reverſe of the *former*; for here the *Price* of the *Mixture* is given, in order to find out the particular *Quantities* of each Sort, which (being mixed together) may make the *Whole* exactly of the *Value given*.

Firſt Example.

I HAVE ſeveral *Sorts* of *Wheat*, ſome at 22 *Shillings* per *Load*, ſome at 19 *Shillings*, ſome at 15 *Shillings*, and ſome at 14 *Shillings*; I would know what *Quantity* of each *Sort* I muſt take, to make the *Mixture* worth 18 *Shillings* per *Load*.

HERE you muſt obſerve, that the *Price* aſſigned for one *Load* of the *Mixture*, muſt be greater than the *leaſt Price*, (or the *Price* of the *cheapeſt Sort*) and *leſs* than the *Price* of the *deareſt*; elſe it is impoſſible for me to make a *Mixture*, to be ſold at that *Price*; as is very plain.

In order to work this *Queſtion*, I ſet down all the *Prices* in Order, one under the other; and the *common Price* on the *left* Hand about the *Middle*; then I link one *Price* above the *common Price*, with another under it: And having thus linked all the *Numbers*, I take the *Difference* betwixt each *Number* and 18, which is the *Price* appointed for the *Mixture*: Theſe *Differences* I ſet down, not over-againſt the *Numbers* themſelves, but againſt *thoſe* with which they are linked; as will appear from the following *Operation*.

Operation.

	Shil.	*Loads.*
Shill.	22	3 at 22 *s.* per *Load.*
18	19	4 at 19 *s.* per *Load.*
	15	4 at 15 *s.* per *Load.*
	14	1 at 14 *s.* per *Load.*

Proof.

3 *Loads*	at 22 *s.*	come to	66 *Shillings.*
4 *Loads*	at 19 *s.*	come to	76 *Shillings.*
4 *Loads*	at 15 *s.*	come to	60 *Shillings.*
1 *Load*	at 14 *s.*	is . . .	14 *Shillings.*

If 12 *Loads* come to . . . 216 *Shillings*;
How much 1 *Load*? *Anſwer*, 18 *Shillings.*

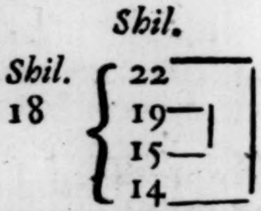
HERE you ſee 22 is linked with 15, and 19 with 14; ſo that every *Link* joins *one Number above* 18, and another *under* 18, which is the common *Price* for the whole *Mixture*.

HERE the *Difference* betwixt 22 and 18, *viz.* 4, is ſet over againſt 15, becauſe 22 is linked with 15; 1, the *Difference* betwixt 19 and 18, is ſet over-againſt 14, becauſe 19 is linked with 14; and ſo of the reſt.

ALL theſe *Differences* being taken for the *Number* of *Loads*, of *that Sort* againſt *which* they are placed, give the *Proportion* or *Quantity* of each *Sort*, which being mixed altogether will make a *Mixture*, worth 18 *Shillings* per *Load*, as appears by the *Proof*.

As I do not deſign to give any more *Examples* of this *Sort*, I ſhall ſhew you ſome other Ways, by which theſe *Numbers* may be *linked*; any one of which will give you a true *Anſwer* to the *Queſtion*.

BESIDES the Way which I uſed *firſt*, it may be done thus:



Loads.				
4	at	22 *s.*	make	88 *Shil.*
3	at	19 *s.*	make	57 *Shil.*
1	at	15 *s.*	is	15 *Shil.*
4	at	14 *s.*	make	56 *Shil.*

Proof. If 12 *Loads* coſt . . . . . . 216 *Shil.*

How much 1 *Load*? *Anſwer,* 18 *Shil.*

Or

Or thus:

	Shil.	*Loads.*	
Shil. 18	22	3.4	7 at 22*s.* make 154 *s.*
	19	4.	4 at 19*s.* make 76 *s.*
	15	4.	4 at 15*s.* make 60 *s.*
	14	1.4	5 at 14*s.* make 70 *s.*

Proof. If 20 *Loads* coſt 360 *s.*
How much 1 *Load?* *Anſwer*, 18 *s.*

After having linked them as in the *firſt Way*, I make another *Link* from 22 to 14, and ſet down their *Differences* alſo; ſo that *two Numbers* ſtand againſt 22 *Shillings* and 14 *Shillings*. Theſe *two Numbers* I add together, in order to have another Anſwer to the Queſtion.

These *Numbers* may be linked ſeveral other *Ways*, which we ſhall not trouble you with; only you muſt remember, that if you take any one *Anſwer*, and *double* each of the Numbers in it, or *triple* them; their *Doubles* or *Triples* will give an Anſwer to this *Queſtion*. In a Word, if you admit of *Fractions*, you may have an infinite Number of *Anſwers* to all Queſtions of this Sort.

But now let us ſuppoſe, that it were required, that the whole Mixture ſhould conſiſt only of 30 *Loads*; it is required to tell the *Number* of *Loads* of *each Sort*, to make the *whole* worth 18 *Shillings* per *Load*.

Having found one *Mixture*, (by the Method above) we muſt *proportion* the 30 *Loads* in the ſame Manner. We ſhall take the *firſt Anſwer* in Page 311, which gives 3 *Loads* at 22 *Shillings*, 4 *Loads* at 19 *Shillings*, 4 at 15 *Shillings*, and 1 at 14 *Shillings*; in all 12 *Loads*, which ought to be 30. Then you muſt ſay;

	Loads.		*Loads.*		*Loads.*		*Loads.*
If	12	give	3	how much	30?	*Anſwer.*	7 ½
If	12		4	. . .	30?	. . .	10
If	12		4	. . .	30?	. . .	10
If	12		1	. . .	30?	. . .	2 ½
						In all	30

Proof.

7 ½	*Loads*	at	22 *s.*	come to	165 *s.*
10	*Loads*	at	19 *s.*	come to	190 *s.*
10	*Loads*	at	15 *s.*	come to	150 *s.*
2 ½	*Loads*	at	14 *s.*	come to	35 *s.*
If 30	*Loads*	come to	. . . .		540 *s.*
	How much 1 *Load?*			*Anſwer.*	18 *s.*

THIS is the *common Method* of working ALLIGATION ALTERNATE, which does well enough in ſome Caſes, but is very difficult, and ſometimes inſufficient, where the Nature of the *Queſtion* requires the *Anſwer* in whole Numbers: We ſhall therefore ſhew you a new *Way* of working all ſuch *Queſtions*.

Alligation Alternate,

By a New Method.

Firſt Example.

SUPPOSE a Merchant has *Wine* at 10, 8, 5, and 4 *s.* per *Gallon*, of which he would mix up 100 *Gallons* that may be worth 6 *s.* each; the Queſtion is, *how much* he muſt take of each Sort?

IT is eaſy to ſuppoſe 100 *Gallons*, and to take what Quantity you pleaſe of thoſe of 10, of 8, and of 5 *s.* Therefore, without being at any Stand, let us at once

ſuppoſe . . . 25 *Gall.* at 10 *s.* which is 250 *s.*
alſo . . . . 25 *Gall.* at 8 *s.* which is 200 *s.*
again alſo . . 25 *Gall.* at 5 *s.* which is 125 *s.*
To make up 100 *Gall.* you muſt take 25 *Gall.* at 4 *s.* which is 100 *s.*

Total . . . 100 *Gallons.* Total . 675 *s.*
at . . . . . 6 *Shil.* they come to but 600 *s.*

which taken from the 675 *s.* ſhews . . 75 *s.* too much.

THE Reaſon of the 100 *Gallons* coming to 75 *Shillings* too much, is that you have taken *too many* at a *higher* Rate, and *too few* at a *lower*; wherefore you muſt take away a *certain Number* of *Gallons* from ſome one *Sort* that coſt *more*, and put in *as many* of one that coſt *leſs*. Now to find out what Number this muſt be, you muſt take the *Difference* of two *Prices*, whichſoever you fix upon, by which you divide what it was *too much*; and the *Quotient* ſhews how many you muſt take away of the greater Price, and put in of the *leſſer*.

THUS taking the *Difference* of the *Price* at 10 *s.* and that at 5 *s.* which is 5, you muſt divide the 75 *s.* too much, by the 5 which gives 15, that is to ſay, 15 *Gallons*, which muſt be taken away from the 25 *Gallons* at 10 *s.* and 15 *Gallons* muſt be added to the 25 *Gallons* at 5 *s.* whereby the 75 too much is taken away, and yet the 100 *Gallons* are complete as was requir'd.

So you'll have 10 *Gal.* at 10 *s.* which are worth 100 *s.*
25 *Gal.* at 8 *s.* which are worth 200 *s.*
40 *Gal.* at 5 *s.* which are worth 200 *s.*
25 *Gal.* at 4 *s.* which are worth 100 *s.*

And 100 *Gal.* at 6 *s.* are worth . . 600 *s.*

TO work theſe *Queſtions*, (as we ſaid before in explaining the common Method) you muſt always have at leaſt *one Price above*, and *one below* the *common Price*, which is here 6 *s.* If you take the *Difference* of the *Price* at 10 *s.* and that at 4 *s.* which is 6, and by that divide the 75 too much, it gives 12½ *Gallons*, which muſt be added to the 25 *Gallons* at 4 *s.* But as the Beauty and Elegancy of this *Rule* conſiſts chiefly in avoiding *Fractions* at Pleaſure, you muſt part the 75 *too much* into *two*, or *three*, or *more* unequal *Parts*, if it be neceſſary; and then *divide* any one of theſe unequal *Parts* by the *Difference* of whichſoever *two Prices* you fix upon. For *Example:* To divide the 75 *s.* too much, by the Difference of 10 and 4, which is 6, we'll take but 72, and there remain 3 to be divided by another *Difference*, taken between any other *two Prices*, taking, if poſſible, ſuch a Difference, as may divide what was left, without any Remainder.

THUS the *6th* Part of 75 is 12, and there remain 3. Theſe 12 denote, that you mnſt take away 12 *Gallons* from theſe at 10 *s.* and put 12 more at 4 *s.* And for the 3 *s.* remaining, let them be divided by the *Difference* between 8 and 5, which is 3; ſo that you muſt take away 1 *Gallon* of 8 *s.* and add 1 of 5 *s.* So by this means we ſhall avoid *Fractions*, and have

Gal.		*s.*		*s.*
13	at	10	which is	130
24	at	8	which is	192
26	at	5	which is	130
37	at	4	which is	148
and 100	at	6	is . .	600

Otherways.

Gal.		*s.*		*s.*
25	at	10	. .	250
10	at	8	. .	80
10	at	5	. .	50
55	at	4	. .	220
100	at	6	. .	600

Laſtly. For Variety; take away 1 *Gallon* at 10 *s.* and 2 *Gallons* at 4 *s.* and add 1 *Gallon* at 8 *s.* and 2 *Gallons* at 5 *s.* or on the contrary, *&c.*

Second Example.

I WOULD mix *Wheat* at 22 *Shillings* per *Load*, with ſome at 19 *s.* ſome at 15 *s.* and ſome at 14 *s.* per *Load*, to make 30 *Loads*, worth 18 *s.* per Load; *How much* muſt I take of each Sort?

THIS Queſtion has been already wrought by the *common Method*, ſo that you may compare the two *Methods* with the greater Eaſe.

I ſuppoſe any *Number* for each Sort, ſo as to have 30 in all; as,

6 *Loads* at 22 *s.* which make : : 132 *s.*
7 *Loads* at 19 *s.* which make : . 133 *s.*
8 *Loads* at 15 *s.* which make . . 120 *s.*
9 *Loads* at 14 *s.* which make : : 126 *s.*

30 *Loads* in all come to : : : . 511 *s.*
30 *Loads* at 18 *s.* come to . . . 540 *s.*

MY Suppoſition is too little by 29 *s.* the Reaſon of which is, that I have taken too many *Loads* of the *coarſer Sorts*, and too few of the *finer*. To correct this, I take the *Difference* betwixt any *two Prices*, as betwixt 22 and 14, which is 8; and I conſider, that I can make the *Mixture* 8 *Shillings* dearer, by caſting out 1 *Load* at 14 *Shillings*, and putting in *one* at 22 *Shillings*; I gain 16 *Shillings* by changing *two Loads*, and 24 *Shillings* by changing *three Loads:* If I change 3 *Loads*, there will be 9 at 22 *Shillings*, and only 6 at 14 *Shillings*; and I have raiſed the *Value* of the *whole*

24 *Shillings* of the 29, which it wanted to make it exactly worth 30 *Shillings* per *Load.*

For the remaining 5 *Shillings*, I ſee it is exactly the *Difference* betwixt 19 and 14; ſo I take away *another Load* at 14 *Shillings*, out of the 6 which remained, and put in *one* at 19 *Shillings:* So it will ſtand thus,

Loads.		*s.*		*s.*
9	at	22	make	198
8	at	19		152
8	at	15		120
5	at	14		70
and 30	at	18	make	540

Otherways.

Loads.		*s.*		*s.*
9	at	22	make	198
9	at	19		171
3	at	15		45
9	at	14		126
and 30	at	18	make	540

In this laſt *Anſwer*, I got 21 *Shillings*, by exchanging 3 *Loads* at 15 *Shillings*, for *as many* at 22 *Shillings*; the *Difference* of *Price* being 7: I alſo exchanged 2 at 15 *Shillings*, for 2 at 19 *Shillings*, by which I gained 8 *Shillings*; which, added to the former 21 *Shillings*, made up the 29 *Shillings*, which the Whole wanted.

You may obſerve here, that in the *firſt Anſwer* I kept the ſame *Number* of *Loads* of the Sort at 15 *Shillings*, as I had ſuppoſed at firſt; ſo that if it had been mentioned in the *Queſtion*, that there muſt be 8 *Loads* at 15 *Shillings*, you ſee it would have occaſioned no Trouble, ſince I never changed them.

In the *ſecond Anſwer*, I kept the *Number* of *Loads* at 14 *Shillings*, as they were in the firſt Suppoſition; which muſt be done ſometimes by the Limitation of the *Queſtion*, as will appear from the following *Examples.*

Third Example.

A *Silver-ſmith* has Occaſion for 80 *Ounces* of *Silver*, of the *Fineneſs* of the *Standard*, as a Part of which he deſigns to melt down a *Piece* of *Plate*, 10 *oz. fine*, weighing 27 *oz.*; for the reſt he has ſome *Silver* 11 $\frac{1}{2}$ *oz. fine*, and ſome pure *Silver*, and if there be need for it, *Copper* for the *Allay*; how much of each muſt he take?

THE preſent *Standard* for *Silver* is 11 *oz.* 2 *p. wt.* or 11,$\frac{1}{10}$ *oz.*; and pure Silver is 12 *oz. fine*. See Page 294.

THERE muſt be no *Change* made here in the 27 *oz.* by the Nature of the *Queſtion*; therefore I ſet down

Weight.	*Fineneſs.*	*pure Silver.*
27 *oz.*	at 10 *oz.* give . .	270 *oz.*

And for the others I take any Numbers, to make up the 80 *oz.* as

10 *oz.*	at 11 $\frac{1}{2}$ *oz.* give . .	115 *oz.*
30 *oz.*	at 12 *oz.* give . .	360 *oz.*
13 *oz.*	*Copper* give . .	0
80 *oz.*	give in all	745 *oz.*
80 *oz.*	at 11 $\frac{1}{10}$ *oz.* give . .	888 *oz.*
So that the whole *Mixture* is too *coarſe* by		143 *oz.*

To help this, I take away 8 *oz.* of *Copper*, of 0 *oz. fine*, and put in as many at 11½ *oz.* which gives 92 *oz. pure Silver* to the *Mixture*, more than it had before: There *remain* 51 *oz.* which is 4 *oz.* 5 *p. wts.* or 4¼ *oz.* at 12 *oz. fine*; therefore, I exchange 4¼ *oz. Copper* for as much pure *Silver*, and it ſtands thus:

Weight.		*Fineneſs.*			*Pure Silver.*
27 *oz.*	at	10 *oz.*	give	. .	270 *oz.*
18 *oz.*	at	11½ *oz.*	give	. .	207 *oz.*
34¼ *oz.*	at	12 *oz.*	give	. .	411 *oz.*
0¾ *oz.*	*Copper*		. . . . .		0
80 *oz.*	in all give				888 *oz.*

Here the Nature of the *Queſtion* can admit of *Fractions*; it being no Impropriety to *divide Ounces*.

However, you may avoid the *Fractions*, if you pleaſe: it is only parting the 143 into 2 ſuch *Numbers* as can be *divided* by 11½ and 12, without any *Remainder*. Had it been 144, it would have been exactly 12 *oz. pure Silver*; and obſerving that 2 *oz.* at 11½ come to 23 *oz.* I take 23 from 143, and the *Remainder* 120, is exactly 10 *oz. pure Silver*; which gives an *Anſwer* to the *Queſtion* without *Fractions*.

Weight.		*Fineneſs.*			*Pure Silver.*
27 *oz.*	at	10 *oz.*	give	. .	270 *oz.*
12 *oz.*	at	11½ *oz.*	give	. .	138 *oz.*
40 *oz.*	at	12 *oz.*	give	. .	480 *oz.*
1 *oz.*	*Copper*	. .	gives	. .	0
80 *oz.*	*Mixture* give in all			. .	888 *oz.*

IF there had been no *Number* of *Ounces* given for the *Weight* of the *Mixture*, the Queſtion would have been a great deal eaſier, and you might find out many *Anſwers* to the *Queſtion* by the *former Method*, or by the laſt explained Method, without any Difficulty. But that nothing may be wanting, I ſhall here ſhew you another Way, which is very eaſy, and may be uſed in all *Sorts* of *Queſtions* in this *Rule*.

INSTEAD of taking the *Prices* themſelves, only take their *Differences*, by which they exceed, or *fall ſhort* of, the *common Price* aſſigned: *As thus;*

IN this laſt *Queſtion*, every *Ounce*, at 10 *oz. Fineneſs* wants 1 *oz.* 2 *p. wts.* of the *Standard*; therefore the 27 *oz.* in all, want 29 *oz.* 14 *p. wts.* which make 594 *p. wts.*

EVERY *Ounce* 11½ *oz. fine* is 8 *p. wts.* better than *Standard*, and every *Ounce* of *pure Silver* is 18 *p. wts.* better than *Standard:* Now, of theſe two *Sorts* you muſt take as many *Ounces* as may be 594 *p. wts.* better than *Standard*, to make up for what the 27 *oz.* were worſe than *Standard.*

Let us try it thus;

	Difference.
The 27 *oz.* at 10 *oz. Fineneſs* want of the *Standard* 22 *p. wts.* each *oz.* in all	594 *p. wts.*
To make up which, I take at a Venture 20 *oz.* at 11½ *oz. Fineneſs*, or 8 *p. wts.* better than *Standard*; which make in all	160 *p. wts.*
And 25 *oz. pure Silver*, 18 *p. wts.* better than *Standard*, which make	450 *p. wts.*
Theſe two, added together, make	610 *p. wts.*
which exceed 594, by	16 *p. wts.*

THIS being exactly twice 8, I take away *two Ounces* at 11½ (out of the 20 which I ſuppoſed); the remaining 18 *Ounces* give an *Anſwer* to the *Queſtion*.

Proof.

Weight.		*Fineneſs.*		*Pure Silver.*
27 *oz.*	at	10 *oz.*	give . .	270 *oz.*
18 *oz.*	at	11½	give . .	207 *oz.*
25 *oz.*	at	12	give . .	300 *oz.*

If 70 *oz.* give . . . . 777 *oz.*
How much 1 *Ounce?* *Anſwer*, 11 *oz.* 2 *p. wts.*

BY this *Method* you may find as many *Anſwers* as you pleaſe in *Fractions*, and ſeveral in *whole Numbers*; without mixing any *Copper*: But if you admit of *Allay*, this *Queſtion* may have innumerable *Anſwers* in *whole Numbers*, as the Curious may find by trying it in the ſeveral *Varieties*.

OBSERVE therefore, in all *Queſtions* of *this Rule*, the *more Sorts* there are which can allow of *Changes*, the *more Anſwers* the *Queſtion* has; and the *fewer Sorts* there are mixed, or the *more Limitations* there are, the *Queſtion* has the *fewer Anſwers*.

Fourth Example.

A *Goldſmith* wants 60 *Ounces* of *Standard Gold*, to make which he melts down an *Ingot* of *Gold*, 18 *Carracts fine*; for the reſt he would take *pure Gold* and *Copper*: *How much* of *each* muſt he mix?

N. B. *Standard Gold* is 22 *Carracts fine*, and *pure Gold* 24 *Carracts fine*. See Page 294.

FOLLOWING the *Method* uſed in the former *Queſtions*, I ſuppoſe it thus:

17 *oz.* at 18 *Car.* make in all	306 *Car.*
30 *oz.* at 24 *Car.*	720 *Car.*
13 *oz.* *Copper* for *Allay* . . .	0
60 *oz.* have in all	1026 *Car.*
60 *oz.* *Standard* at 22 *Car.* make	1320 *Car.*
Our *Mixture* wants	294 *Car.*

BY the *Nature* of the *Queſtion*, none of the 17 *oz.* at 18 *Car.* can be taken away; therefore there can no *Exchange* be made, but of ſome *pure Gold* for *Copper*; and, of Conſequence the *Queſtion* (with this Limitation) admits but of *one Anſwer*, which is found thus: I divide the 294 *Carracts*, which the Mixture wanted, by the *Difference* betwixt the *pure Gold* and the *Copper*, viz. 24 *Carracts* (ſince the *Copper* has no *Fineneſs*); the *Quotient* 12¼ ſhews, that ſo many *Ounces* of *Copper* muſt be taken away, and as much *Gold* put in; then it will ſtand in this Manner.

17 *oz.* at 18 *Car.* make .	306 *Car.*
42¼ *oz.* at 24 *Car.* . . .	1014 *Car.*
0¾ *oz* *Copper*	0
60 *oz.* have in all	1320 *Car.*
and 1 *oz.*	22 *Car.*

THESE *Examples* may ſuffice for any *Queſtion* that may occur in this *Rule*; always remembring to obſerve the *Limitations* given in the *Queſtion*, ſo as not to make any *Alterations* in *theſe Sorts*, which ought to be kept *whole* and *entire*; and never *admitting* of *Fractions* contrary to the Nature of the *Things* to be mixed.

BEFORE I cloſe this *Rule*, I ſhall exhibit a *Table* of all the poſſible *Anſwers*, which can be had in *whole Numbers* to the *Queſtion* propoſed in the *common Method*, which was likewiſe the *ſecond Queſtion* in this *Method*.

Num.

Num. of Anſ.	Loads at 22 *s.*	Loads at 19 *s.*	Loads at 15 *s.*	Loads at 14 *s.*
1	1	22	2	5
2	1	21	7	1
3	2	20	4	4
4	3	19	1	7
5	3	18	6	3
6	4	17	3	8
7	4	16	8	2
8	5	15	5	5
9	6	14	2	8
10	6	13	7	4
11	7	12	4	7
12	7	11	9	3
13	8	11	1	10
14	8	10	6	6
15	9	9	3	9
16	9	8	8	5
17	10	7	5	8
18	10	6	10	4
19	11	6	2	11
20	11	5	7	7
21	11	4	12	3
22	12	4	4	10
23	12	3	9	6
24	13	3	1	13
25	13	2	6	9
26	13	1	11	5
27	14	1	3	12

I SHALL beg Leave to propoſe one *Queſtion* here, without giving the *Anſwer*.

Sixty Perſons, *Men*, *Women*, *Boys* and *Girls*, ſpent 100 *Pounds*, in this Manner; each *Man* ſpent 2 *Pounds*, each *Woman* 13 *Shillings* and 4 *Pence*, each *Boy* 12 *Shillings*, and each *Girl* 10 *Shillings*; How many *Men*, *Women*, &c. were there?

THE Nature of this *Queſtion* admits of no *Fractions*, and there is but one *Anſwer* in *whole Numbers*, which I leave to be found out by the Learner's own Induſtry.

The Single Rule of Falſe Poſition.

THIS *Rule* is ſo called, becauſe by a *falſe Suppoſition*, or by taking a *falſe* Number (at a *Venture*) inſtead of the *true one*, and working with *it* according to the *Nature* of the Queſtion, we diſcover the true *Number*. This will beſt appear by peruſing carefully the following *Examples*.

I. *Example.* *Four* Men have a certain *Sum* to be ſhared amongſt them, in ſuch manner, that the *firſt* ſhall have $\frac{1}{3}$ of it, the *ſecond* $\frac{1}{4}$, the *third* $\frac{1}{6}$, and the *fourth* the *Remainder*, which is 28: 'Tis demanded what this *Sum* is?

SUPPOSE 12 to be the *Sum*; the $\frac{1}{3}$ of which is 4, the $\frac{1}{4}$ is 3, the $\frac{1}{6}$ is 2, which make 9, and this, being taken from 12, the ſuppoſed *Number*, leaves 3; then ſay; If 3 *Pounds* remain from 12; from what remain 28? *Anſwer*, From 112 *Pounds*.

FOR *Proof*, Add the $\frac{1}{3}$, the $\frac{1}{4}$, and the $\frac{1}{6}$ of 112 *Pounds*, to 28 *Pounds*, *&c.* thus

Of 112 *Pounds*,
The $\frac{1}{3}$ is $37\frac{1}{3}$ *l.* for the *firſt*,
the $\frac{1}{4}$ is 28 *l.* for the *ſecond*,
the $\frac{1}{6}$ is $18\frac{2}{3}$ *l.* for the *third*,
the *Rem.* 28 *l.* for the *Fourth*.
In all 112 *l.* *Pounds*.

II. *Example*. A *Miller* having 3 *Mills*, the *firſt* of which can grind 9 *Buſhels* of Corn in an *Hour*, the *ſecond* 7, and the *laſt* 4; in *how long Time* would they all three be grinding 300 *Buſhels*?

ADD 9, 7 and 4 together, makes 20 *Buſhels*, which they can grind in 1 *Hour*; and you need but ſay; if 20 *Buſhels* be ground in 1 *Hour*; in *how many* 300 *Buſhels*? *Anſwer*, in 15 *Hours*.

III. *Example*. A *Ciſtern* being fill'd, that has 3 *Cocks*, by the *firſt* of which it can empty itſelf in 3 *Hours*, by the *ſecond* in 4 *Hours*, and by the *laſt* in 6 *Hours*; in *how long* will it empty itſelf, if you ſet all the *three Cocks* running together?

ADD the $\frac{1}{3}$ of 12, which is 4, to the $\frac{1}{4}$, which is 3, and to the $\frac{1}{6}$, which is 2, which gives 9 *Meaſures*, that ran out in *one Hour*; and ſay; If 9 run out in 1 *Hour*, in *how long* will 12? *Anſw.* in $1\frac{1}{3}$ *Hour*, or 1 *Hour*, 20 *Minutes*.

IV. *Example*. What *Number* is that, the $\frac{1}{2}$, the $\frac{1}{3}$, and the $\frac{1}{4}$ of which, join'd together, make 104?

SUPPOSE 12; the $\frac{1}{2}$, the $\frac{1}{3}$, and the $\frac{1}{4}$ of which make 13. And then ſay; if 13 proceeds from 12, from what proceed 104? *Anſ.* From 96, *&c.*

The Double Rule of Falſe Poſition.

THE laſt *Rule* is ſufficient to work any *ſimple Queſtion*, where the *Number ſought* being *multiplied* or *divided*, in a certain Manner, comes to a certain *Number* given: But if the *Queſtion* be more intricate, you muſt make *two Suppoſitions*, as in the *following Examples*; among which you'll find *one* or *two* wrought by different Methods without any *Suppoſitions*, tho' theſe may be wrought like the *reſt*.

Firſt Queſtion. A certain Perſon, having forgot the *Day* of the *Month*, deſir'd his Neighbour to tell him *it*; but he replied, the *Month* had 30 *Days*, and if he would add $\frac{1}{4}$ of the *Days* of the *Month*, which were already paſt, to $\frac{1}{2}$ of the *Days* which were to *come*, he would have what he deſir'd: *Quære*, what Day of the Month it was?

1ſt. *Suppoſe* it was the *16th Day* of the *Month*, then there would remain 14 *Days* to 30; but the $\frac{1}{4}$ of 16, added to $\frac{1}{2}$ of 14, make but 11 *Days paſt*, and we *ſuppoſed* 16; wherefore you muſt write down 5 leſs than the 16 *ſuppoſed*: Afterwards make another *Suppoſition* different from the former.

2*dly*. *Suppoſe* it was the 20*th* Day, then it would want 10 of 30; but the ¼ of 20, and the ½ of 10, make but 10, and we ſuppoſed it was 20; wherefore under the *firſt Suppoſition*, and the *firſt Difference*,
which is 5 *too little*, coming from 16 *ſuppos'd*, write
down this laſt, which
is 10 *too little*, coming from 20 *ſuppos'd*.

5 *Diff.* of 10 and 5. 4 *Diff.* of 20
and 16.

HAVING found 5 to be the *Difference* of the *two Differences*, and 4 the *Difference* of the two *ſuppoſed Numbers*; ſay; If the *Diff.* 5 proceeds from . . . 4, from what proceeds the *Diff.* 10? *Anſw.* From 8, which muſt be taken from the 20 over-againſt the 10. Or elſe; if the *Diff.* 5 —— 4, from what the *Diff.* 5? *Anſw.* From 4, which muſt be taken from 16, becauſe the 5 is over-againſt it, and you will have 12 remaining, that is to ſay, the 12*th Day* of the *Month*, which is the *Anſwer*.

IF the *two Differences* were *too much*, you muſt work as above; but inſtead of *taking away* from *one* of the *ſuppoſed Numbers*, you muſt *add* to *it* the *Anſ.* of the *Rule of Three*.

IF you ſuppoſe it to be the 4*th Day* of the *Month*, then working the *Queſtion* as above, you will find .

10 *too much*, coming from 4 *ſuppoſed*, under
which write down
5 *too little*, coming from 16 the *firſt ſuppoſed*
Number

Tot. 15 the *Diviſor*, 160 *Prod.* of 10 times
16. 20 *Prod.* of 4 times 5.

The 15*th* of . . . . . 180 is 12, the *Day* of the *Month*, given for the *Anſwer*.

YOU may eaſily perceive, that the *four Numbers* above, are *multiplied* croſs-ways; and that the *Total* of the two *Products*, *divided* by the *Total* of the two *Differences*, produces the *Anſwer.*

Second Queſtion. Three Men have 100 *l.* to be ſhared amongſt them; the *Second* is to have for his *Share*, *twice* as much as the *Firſt*, all but 8 *l.* and the *Laſt three* times as much, all but 15 *l.* The *Queſtion* is, *what* the *firſt Man* will have, and alſo *what* the *other two*?

Suppoſe the *firſt* has : 1 *Pound.*

If the *ſecond* has *twice* as
much, all but 8 *l.* he will have 2 *Pounds*, leſs 8 *Pounds.*

And if the *third* has 3 times as
much, all but 15 *l.* he will have 3 *Pounds*, leſs 15 *Pounds.*

Total . . . 6 *Pounds*, leſs 23 *Pounds.*

ADD the 23 *Pounds* leſs, to the 100 *Pounds* that were to be ſhared, makes 123 *Pounds*; the *6th Part* of which is 20 *Pounds* 10 *Shillings* for the *firſt Man's Share*; by which you may find what belongs to the *other two*, which is 33 *Pounds*, for the *ſecond*; and 46 *Pounds* 10 *Shillings*, for the *third.*

IF they were all *more*, or *more* and *leſs*, you muſt act according to the following *Examples.*

The *Queſtion* may be *thus* propoſed.	**Or *thus*.**	**Or *thus*.**
1 *l.* for the *Firſt*, 1 *l.* *more* 12 ½, for the 2*d.* 1 *l.* *more* 26, for the 3*d.*	1 *l.* 1 *l.* *more* 12 ½, 3 *l.* *leſs* 15.	1 *l.* 2 *l.* *leſs* 8 *l.* 1 *l.* *more* 26 *l.*
3 *l.* *more* 38 ½, taken from 100 *l.* leaves 61 ½, the ⅓ of which, is 20 ½, *&c.*	5 *l.* *leſs* 2 ½, and 100 *l.* make 102 ½, the ⅕ of which is 20 ½.	4 *l.* *more* 18 *l.* taken from 100 *l.* leaves 82, the ¼ of which is 20 *l.* 10 *s.*

For if the *Queſtion* were propoſed, any of theſe Ways, it would be the ſame in Effect; only you muſt obſerve, where-ever it is *more*, it muſt be *taken away* from 100 *l.* but where it is *leſs*, it is *added* to 100 *l.*

Third Queſtion. A Farmer, as he was going to Market, ſaid, if he ſold all his *Corn* at 30 *Shillings* the *Load*, he ſhould have enough to pay all his Debts, and 500 *Shillings* to ſpare; but if he ſold it all at but 20 *Shillings* the *Load*, he ſhould ſtill remain 500 *Shillings* in Debt; whereupon it is required to tell, *how many Loads* of *Corn* he had, and *how much* he owed?

THIS *Queſtion*, as well as the foregoing, is eaſily anſwer'd by the *Double Rule of Falſe Poſition*, in like Manner, as we anſwer'd the *Queſtion* made about the *Day* of the *Month*; but it may be more eaſily anſwer'd, by adding

the 500 *s.* to ſpare, which the Farmer would have remaining,
to the 500 *s.* that he would ſtill owe, which

ſhews 1000 *s.* to be *divided* by the *Difference* of the

two Prices, 30 *s.* and 20 *s.* the *Load*, which is 10; whereby you have the *Anſwer*, *viz.* 100 *Loads* at 30 *s.* they come to 3000 *s.* from which taking the 500 *s.* to ſpare, leaves 2500 *s.* the *Sum* of all his Debts.

FOR *Proof.* 100 *Loads* at 20 *s.* come to 2000 *s.* which taken from the 2500 *s.* which he owes, there remain 500 *s.* which he is ſtill in Debt.

Fourth Queſtion. *Peter* ſays to *James*, if I had 5 of your Crowns, I ſhould have *twice* as many as you would have left; and ſays *James* to *Peter*, if I had 3 of yours, I ſhould have 4 *times* as many as you; the *Queſtion* is, *how many* each had?

1ſt. Suppoſe *Peter* had 5, then upon receiving 5 of *James*, he'll have 10; which is twice as much as 5, which would be remaining to *James*; then 'tis plain *James* had 10 before he gave 5 of them to *Peter*.

Now, to ſee if your *Suppoſition* be right, you muſt ſay, *Peter* has 5 Crowns, and *James* has 10, according to our *firſt Suppoſition*. Then *Peter*, upon giving 3 to *James*, would have but 2 left, and *James* would have 13: But to have 4 times as much as *Peter* had then, he need have but 8 (which is 4 times as much as the 2, which *Peter* has remaining): then *James* has 5 too many, upon the *Suppoſition* of *Peter* having 5.

2dly, Suppoſe *Peter* has 7; then work after the ſame Manner as above, and you'll find *James* has 2 leſs than he ſhould have; and at laſt you'll find, *Peter* ſhould have $6\frac{3}{7}$; and by that you'll eaſily know, that *James* ſhould have $10\frac{5}{7}$.

If you had ſuppoſed *James's* Number, you would firſt have found how many Crowns he ſhould have, and from thence how many belong'd to *Peter*.

Fifth Queſtion. What *two Numbers* are thoſe whoſe *Total* is 82, and the *6th* Part of one of them, added to the *5th* Part of the other, makes 14?

1ſt. If you *ſuppoſe one* to be 36, the *other* muſt be 46; but the *6th* Part of 36, and the *5th* Part of 46, make $15\frac{1}{5}$, inſtead of 14, which is $1\frac{1}{5}$ too much from *ſuppoſing* 36.

2dly. If you *ſuppoſe* 66, the other *Number* muſt be 16; but the *6th* Part of 66, and the *5th* Part of 16, make $14\frac{1}{5}$, which ought to be but 14, which is ſtill $\frac{1}{5}$ too much from *ſuppoſing* 66. Then ſay; If the *Difference* 1 proceeds from the *Difference* 30; from what does the *Difference* $\frac{1}{5}$ proceed? *Anſw. 6*, which being added to 66, gives 72, for *one* of the Numbers, and 10 muſt be the *other*.

1ſt. Sup. 1 $\frac{1}{5}$ too much, coming from 36 ſuppoſed.
2d. Sup. $\frac{1}{5}$ too much, coming from 66 ſuppoſed.

If the *Diff.* 1 gives the *Difference* 30; *How much* $\frac{1}{5}$? *Anſwer 6.*

Sixth Queſtion. What *two Numbers* are thoſe, whoſs *Difference* is 4, and their *Product*, when *multiplied* together, is 96?

ADDING 16, the *Square* of the *Difference* 4, to 384, the *Quadruple* of the *Product* 96, makes 400, the *Square Root* of which is 20, the *Sum* of theſe *two Numbers*; from which taking 4, leaves 16, the *Half* of which is 8, the *leaſt* Number; and the *other Half*, added to the *Difference* 4, makes 12, the *biggeſt Number*.

Seventh Queſtion. What two Numbers are thoſe, which *added* together make 8, and *multiplied* together produce 12?

THE *Square* of *Half* the *Total* 8, is 16, from which *ſubtracting* the *Product* 12, leaves 4, the *Square Root* of which is 2, which is $\frac{1}{2}$ the *Difference* of theſe *two Numbers*; which being *added* to the *one Half* of the *Total*, and *ſubtracted* from the *other*, gives 6, and 2, *&c.*

Eighth Queſtion. What *two Numbers* are thoſe, whoſe *Total* is 12, and the *Sum* of their *Squares* is 80?

FROM 160, the *Double* of 80, take away 144, the *Square* of 12, and there remain 16; the *Square Root* of which is 4, *added* to 12, makes 16; the *Half* of which is 8, the *biggeſt* Number, and 4 is the *leaſt*, *&c.*

Ninth Queſtion. What *two Numbers* are thoſe, which, added together, make 32; and *divided* by *one another*, the *Quotient* is 3?

ADD 1 to the *Quotient* 3, makes 4, by which *dividing* 32, gives 8, the *leaſt Number*; which *ſubtracted* from 32, leaves 24, the *biggeſt Number*, &c.

Tenth Queſtion. *Five* Men gain the following *Sums*, viz.

The *firſt* and *ſecond* . . .	238 *l.*
The *ſecond* and *third* . .	512 *l.*
The *third* and *fourth* . .	600 *l.*
The *fourth* and *fifth* . .	352 *l.*
The *fifth* and *firſt* . . .	226 *l.*

The Queſtion is, *How much* they all gained, and *what* each one gained in particular?

The whole *Gain* is ½ of 1928 *l.* which is 964 *Pounds*; from which *ſubtracting* the *Sum* of the *ſecond* and *third*, *added* to that of the *fourth* and *fifth*, leaves 100 *Pounds* for the *firſt*; whereby you may eaſily find out what belongs to the other: You take the *Half* of 1928, becauſe each *Perſon's Sum* is counted *twice* over; if they had been counted 3 *times* over, you muſt have taken the *Third*, &c.

Eleventh Queſtion. Four Perſons have *each* an unknown *Sum*; but this they know, the *Sums* of

the 1*ſt*. 2*d*. and 3*d*. make . . 16 *l*.
the 2*d*. 3*d*. and 4*th*. make . . 19 *l*.
the 3*d*. 4*th*. and 1*ſt*. make . . 23 *l*.
the 4*th*. 1*ſt*. and 2*d*. make . . 26 *l*.
What Sum has each particular Perſon?

THE *Third* Part of . . . 84 *l*. is 28 *Pounds*, from which taking 19 *Pounds*, leaves 9 *Pounds* the *firſt* Man's *Sum*; whereby you may eaſily find all the *three* others: Or elſe from 28 taking 16 *Pounds*, leaves 12 *Pounds*, the *fourth* Man's *Sum*; taking away 23 *Pounds*, leaves 5 *Pounds*, the *ſecond* Man's *Sum*; taking away 26 *Pounds*, leaves 2 *Pounds*, the *third* Man's *Sum*, &c.

Twelfth Queſtion. A certain Man made his Will, by which he gave his *eldeſt* Son 100 *Pounds*, and $\frac{1}{4}$ of what he left beſides; to the *ſecond* he gave 200 *Pounds*, and $\frac{1}{4}$ of all that remain'd; to the *third* he gave 300 *Pounds*, and $\frac{1}{4}$ of the Remainder; and ſo on to the laſt, who was to have all that was left; when they had all taken their Shares, they found they had all alike: The *Queſtion* is, how many Sons there were, and *how much* the *Father* left?

IF you well examine all the Circumſtances of this *Queſtion*, you will find according to the Order, and Principles of *Falſe Poſition*, that the Father had 900 *Pounds*, and 3 *Sons*.

Otherwiſe, and which is the ſhorteſt Way; Take the *Uppermoſt* from the *Undermoſt* of the Fraction, which expreſſes the *Part* of the *Remainder*; and what remains of this *Undermoſt* will be the *Number* of Sons; the *Square* of which, multiplied into the *Sum* which the *firſt* has given to him, produces the *Sum* which the *Father* left.

If the *Father* had given the *firſt* 200 *Pounds*, 300 *Pounds*, or any other *Sum*, with the 3*d*, the 4*th*, the 5*th*, or the 6*th* of the Remainder, or any other Part, which had an *Unit* for its *Uppermoſt*, you muſt have proceeded after the ſame Manner.

Thirteenth Queſtion. *M* ſays to *P*, If I had one of your *Piſtoles*, I ſhould have 3 *times* as many as you would have *left*; and ſays *P*, if I had *one* of yours, I ſhould have *twice* as many as you would have *left*; *how many* had each? According to the Principles of *Falſe Poſition*, you will find that *M* ſhould have $2\frac{3}{5}$ *Piſtoles*. and *P* $2\frac{1}{5}$ *Piſtoles*.

To reſolve all *Queſtions*, that are propoſed after the Manner of this laſt, you need but multiply the Quantity that each gives the other by $2\frac{1}{5}$, and by $2\frac{3}{5}$, to have the two *Anſwers*; and ſo in all other Queſtions where they give one another the ſame Quantity.

Fourteenth Queſtion. *A* ſays to *B*, If I had 4 of your Sheep, I ſhould have as many as you; and ſays *B*, if I had 4 of yours, I ſhould have twice as many as you; *How many* had each?

Following the Principles, and Way of Reaſoning in *Falſe Poſition*, you will find *A* has 20, and *B* has 28; by which *two Numbers* 20, and 28, you may multiply any other Number as well as 4, which they give to each other; which is a general Rule.

Fifteenth Queſtion. *Three* Merchants put into Stock each an unknown *Sum:* This they know, that what the *firſt* put in, added to *Half* what the other *two* put in, makes 17 *l.* what the *ſecond* put in, added to the *third* Part of what the *two* others put in, makes alſo 17 *l.* and what the *third* put in, added to the one *Fourth* of the two others, makes alſo 17 *l.* 'Tis required to tell *how much* each put in particularly?

1*ſt*. Suppoſe the *firſt* put in 3 *Pounds*, which taken from 17 *Pounds*, leaves 14 *Pounds*, the *Half* of what *both* the other *two* put in: Now if 14 *Pounds* be ½ what they both put in, then they muſt have put in 28 *Pounds*; which being added to the 3 *Pounds* we ſuppoſed for the *firſt*, gives 31 for what they all *three* put in.

EXAMINING what remains to be done to this *firſt Suppoſition*, we ſhall ſee, that we muſt find out ſuch a Number, as which, taken from 31, and added to a *third* Part of the Remainder, will make 17.

LET us *firſt ſuppoſe* the Number to be 7, which taken from 31, leaves 24; the *Third* of which is 8, and this added to 7 makes 15 *Pounds*, inſtead of 17 *Pounds:* This gives 2 *too little*, from ſuppoſing 7.

LET 4 be taken from 31, the Remainder is 27, the *Third* of which is 9; with this 4 makes 13, inſtead of 17: This gives 4 *too little*, from ſuppoſing 4.

WHEN you have finiſh'd the Operation, you will find, that the *ſecond* Man put in 10 *Pounds*.

THEN from 31 *Pounds* taking 3 *Pounds*, which the *firſt* put in, and 10 *Pounds*, which the *ſecond* put in, there will remain 18 *Pounds* for the *third:* But the ¼ of 13 *Pounds*, which is 3 ¼, with what the *third* put in, makes 21 ¼ : And inſtead of that he ſhould have but 17 *Pounds* : This gives 4 ¼ too much.

From the 3 *l.* ſuppoſed for the *firſt*,
from the 10 *l.* ſuppoſed for the *ſecond*,
from the 18 *l.* ſuppoſed for the *third*.

NOW you are got juſt half Way, and muſt begin *another Suppoſition* for the *firſt* Man, and proceed exactly after the ſame Manner as here above. Wherefore you muſt take good Care to reaſon all along, after the ſame Manner, and in all ſuch-like Caſes.

2dly. Let the *firſt* Man's Number be 2 *Pounds*, which taken from 17 *Pounds*, leaves 15 *Pounds* ; the *Double* of which is 30, added to 2 *Pounds*, makes 32 *Pounds* for all *three*.

NOW you muſt find ſuch a Number, as taken from 32, and the third Part of the Remainder added to it, may make 17 *Pounds*.

1ſt. Suppoſe 5 be taken from 32, the Remainder will be 27; the *third* of which being 9, added to 5, make 14; which ſhould be 17 *Pounds*: This gives 3 too little from ſuppoſing 5.

2dly. Suppoſe 8 be taken from 32, the Remainder will be 24; the third of which is 8, added to the 8 that was ſuppoſed, makes 16, inſtead of the 17 *Pounds*: This gives 1 too little, from ſuppoſing 8.

HAVING finiſh'd the Operation after the uſual Way, you will find that the ſecond Man put in 9 ½ *l.* which taken from 32 *Pounds*, leaves 22 ½ *Pounds* for the other two; from which taking the 2, that was ſuppoſed for the *firſt* Man, leaves 20 ½ *Pounds* for the *third*: But the *fourth* Part of what the two *firſt* put in, added to the 20 ½ *Pounds* of the *third*, makes 23 ⅜ *Pounds*, which ſhould have been but 17 *Pounds*: Then this gives 6 ⅜ too much, from

2 *Pounds* ſuppoſed for the *firſt*,
$9\frac{1}{2}$ *Pounds* ſuppoſed for the *ſecond*,
$20\frac{1}{2}$ *Pounds* ſuppoſed for the *third*.

THERE are *three Operations* ſtill to be wrought to find the *three Anſwers*; which we ſhall here ſtate in Order.

$4\frac{1}{4}$ too much, from ſuppoſing 3 *l.* for the 1*ſt*.
$6\frac{3}{8}$ too much, from ſuppoſing 2 *l.* for the 1*ſt*.

If $2\frac{1}{8}$ the *Difference* gives . . . . 1 *l.* *How much* $4\frac{2}{8}$?

Anſ. 2, which being added to the 3, gives 5 *Pounds* for the *firſt*.

$4\frac{1}{4}$ too much, from 10 *l.*
$6\frac{3}{8}$ too much, from $9\frac{1}{2}$ *l.*

If $2\frac{1}{8}$ *Difference* gives $\frac{1}{2}$;
How much $4\frac{2}{8}$? *Anſ.* 1.
which with 10 makes 11.

$4\frac{1}{4}$ too much, from 18 *l.*
$6\frac{3}{8}$ too much, from $20\frac{1}{2}$ *l.*

If $2\frac{1}{8}$ *Differ.* gives $2\frac{1}{2}$;
how much $4\frac{2}{8}$? *Anſ.* 5. w^{ch}
taken from 18, leaves 13.

HAVING wrought the *Operations*, you find the *firſt* put in 5 *l.* the *ſecond* 11 *l.* and the *third* 13 *l.* And theſe three *Anſwers* will ſerve for a general Rule, to anſwer all *Queſtions* of the like Sort, whatever Sum be ſet inſtead of the 17 *l.* for you need only ſay by a *Rule of Three*, as in *Fellowſhip*;

If 17 *Pounds* give 5 *Pounds*,
If 17 *Pounds* give 11 *Pounds*,
If 17 *Pounds* give 13 *Pounds*,
How much will any *Sum* whatever?

Arithmetical Progreſſion.

ARITHMETICAL *Progreſſion* is a *Rank* or *Series* of Numbers all different; and the *Difference* between every *Number*, and that which *goes before* it, and that which *follows after* it, is all the Way the *ſame*; as you may ſee in the following *Examples*.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and ſo *ad infinitum*, is call'd *Natural Progreſſion*. To find the *Sum Total* of theſe *eleven* Terms, (or of an *Hundred Thouſand*, if there were ſo many of them) add 1 the *firſt* Term to 11 the *laſt* Term, makes 12; which multiplied by 11 the *Number* of Terms, will produce 132; the *Half* of which is 66, the *Sum Total* of all the *eleven* Terms added together. *Otherways*, Multiply 12 by 5 ½, the *Half* of 11 Terms, will give alſo 66. Or, *Laſtly*, Multiply 6 the *Half* of 12 by 11 Terms, produces the ſame Number 66: And thus you muſt obſerve to work all Queſtions in *Arithmetical Progreſſion*, let them begin or end with whatever Numbers you pleaſe.

1, 3, 5, 7, 9, 11, 13, 15, make 64. For 15 and 1 make 16, which multiplied by *Half* the 8 Terms, produce 64.

5, 8, 11, 14, 17, 20, make 75. For 5 and 20 make 25, which multiplied by the ½ of 6 Terms, produces 75.

A Merchant ſells 50 *Ells* of Holland, on Condition that he ſhall have 1 *s.* for the *firſt*, 2 *s.* for the *ſecond*, 3 *s.* for the *third*, and ſo on to the *laſt*; the *Queſtion* is, *How much* Money he is to have?

SINCE there are 50 *Ells*, there are 50 *Terms*, the firſt of which is 1, added to 50 the laſt, makes 51; which multiplied by 50 the Number of all the Terms, produces 2550; the *Half* of which is 1275 *s.* the *Anſwer.*

FOR *Proof.* You muſt ſay, A Merchant ſells *Holland* to the Value of 1275 *s.* For the *firſt Ell* he has 1 *s.* for the *ſecond* he has 2 *s.* for the *third* 3 *s.* *&c.* *How many* Ells muſt he have ſold? *Doubling* 1275 *s.* gives 2550 *Shillings*; the *Square Root* of which is 50 *Ells*, the *Anſwer*; and 50 the Remainder of the Diviſion, which is the *Proof.*

Geometrical Progreſſion.

GEOMETRICAL *Progreſſion*, is a Series of Numbers, rang'd after the following Manner.

1ſt Progreſs. call'd *Double*, 1, 2, 4, 8, 16, 32, &c.
2d Progreſs. call'd *Triple*, 1, 3, 9, 27, 81, &c,
3d Progreſs. call'd *Quadruple*, 1, 4, 16, 64, &c.
4th Progreſs. call'd *Quintuple*, 1, 5, 25, 125, &c.

TO find the *Sum Total* of a *Geometrical Progreſſion* continued, let it begin and end with whatſoever Numbers you pleaſe; you muſt ſubtract the *firſt* Term from the *laſt*, and divide the *Difference* by the *Quantity* of the *Progreſſion*, that is to ſay, by 1, 2, 3, or 4, &c. if it be the *firſt*, the *ſecond*, the *third*, or the *fourth*, &c. afterwards add the *laſt Term* to the *Quotient*.

THUS in the firſt *Progreſſion*, ſubtracting the *firſt* Term 1 from the *laſt* Term 32, leaves 31, which divided by 1, gives 31, which with the laſt Term 32, makes 63. In the ſecond *Progreſſion*, ſubtracting the *firſt* Term 1 from the *laſt* Term 81, leaves 80, which divided by 2, (becauſe it is the *2d Progreſſion*) gives 40, which with the *laſt* Term 81, makes 121, the *Sum Total* of the *five* Terms; and ſo for the others.

A Linen-Draper ſells 20 *Ells* of Holland; for the *firſt Ell* he receives 1 *s.* for the *ſecond* 2 *s.* for the *third* 4 *s.* for the *fourth* 8 *s.* and ſo on for them all; *How much* Money is he to receive?

    2 3 4 5   6   7   8   9   10   11   12
1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048,
13   14   15   16   17   18   19
4096, 8192, 16384, 32768, 65536, 131072, 262144,
20
24288.

Twice the laſt Term leſs 1, gives the *Anſwer*, 1048575 *s.* which make 52428 *l.* 15 *s.* the Value of the 20 *Ells.*

You might very well ſave yourſelf the Trouble of writing down all the 20 Terms at Length, by ſetting down only the firſt 7, or 8; as 1, 2, 4, 8, 16, 32, 64; and then ſaying; If 1 the firſt Term, gives 8 for the *fourth* Term; *How much* will the *ſeventh* Term give? *Anſ.* 512, the *tenth* Term. The *Difference* between the *tenth* Term and *ſeventh*, is proportionate to the *Difference* between the *ſeventh* Term and the *fourth*, and alſo between the *fourth* and the *firſt*.

Laſtly, Multiplying 512 by itſelf, or ſquaring it, ſhews the *nineteenth* Term, the *Double* of which is the *twentieth*, or *laſt* Term: Now 512 being the *tenth Term*, it has 9 Terms before it; and by conſequence the *Square* will be the *ninth* Term after it, or the *nineteenth* of the *twenty Terms*.

Since it ſeldom happens, that in Buſineſs there is any Occaſion for theſe *Progreſſions*, or *Falſe Poſitions*, and all others, which are call'd, *Rules of Curioſity*, it may be objected againſt our inſerting them in this Book; as if they only ſerv'd for an Amuſement, and waſting of Time: To which it may be anſwer'd; that tho' it be true, that they are not always needful, yet to amuſe one's ſelf thus with Diſcretion is not loſt Time, ſince this is the moſt proper Way to improve the Mind, by learning how to think and reaſon juſtly upon Numbers, in order to penetrate into the Beauty and Subtlety of them; which is certainly very advantageous on ſeveral Occaſions.

Of the Square, *and* Cube Roots.

ANY Figure that is as *broad* as it is *long*, is call'd a *Square:* And a Figure that is as *high* as it is *long* and *broad*, as a Dye to play with, which is a *Cubic Figure*, is call'd a *Cube*, which has *ſix* Faces, or equal Sides all *ſquare*.

EVERY *Number* is the *Square Root* of what it produces when it is *multiplied* into, or by *itſelf*; and conſequently the *Product* of any *Number*, which is *multiplied* by *itſelf*, is the *Square* of this ſaid *Number*; and every *Number* ſquar'd, multiplied by its *Root*, produces the *Cube* of this *Root*; as you may ſee in the Table underneath, which ſhould be got by Heart.

The firſt Row of Numbers following are ten Roots.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Their ten Squares are,

1, 4, 9, 16, 25, 36, 49, 64, 81, 100.

And their ten Cubes are,

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000.

You ſee, for *Example*, that 2 *multiplied* by itſelf, that is to ſay, by 2, produces its *Square* 4, which is under it; and this *Square* 4, being multiplied by its *Root* 2, which is at Top, produces its *Cube* 8, which is at *Bottom* below the 4, *&c.*

To find the *Cube Root* of any Number, which is larger than 8, and leſs than 27, as 25; you muſt ſay, the *Cube Root* of 25 is but 2; and ſubtracting the *Cube Root* of 2, which is 8, from the ſaid 25, leaves 17. In like Manner, the *Square Root* of 8 is but 2, the *Square* of which is 4, being taken from 8, leaves 4, *&c.*

Firſt Example.

625 Men being plac'd in a Square Battalion; *how many* muſt there be in *Front*, and in *Flank*; or *how many* every Way? *Anſw.* 25 in *Front*, and 25 in *Flank*.

This *Queſtion* is only to find the *Square Root* of 625. And the firſt thing you have to do, is to make a *Dot* or *Separation*, between every two Figures in the 625, beginning at the Place of *Units* on the *Right-hand*; but as there are but *three* Figures in all, the *laſt Part* on the *Left-hand* will have but one *Figure*, and the other, two: After that you muſt work the Diviſion after the common Way, only you muſt find out a *Diviſor*.

Firſt Operation.

Diviſor.		*Quotient.*
2)	6.25	2 or
	4	*Roots.*
	2	

HAVING ſet down and ſeparated the 625, as here in the *Operation*, and found that the *Square Root* of 6 is but 2; you muſt ſet down this 2 in *two* Places, *viz.* in the *Quotient*, and in the *Diviſor*: Then ſaying, twice 2 is 4, taken from 6, leaves 2 *below*, as in common *Diviſion*; this finiſhes the firſt *Operation*.

FOR the ſecond and laſt *Operation*, I bring down the next *two Figures*, which gives 225 to be *divided*: But as we have no *Diviſor* but what we muſt find out, we muſt double all the *Quotient*, which being but 2 makes 4, for a *Diviſor* of the 22 Tens of 225: Then having ſet down 4, for a freſh *Diviſor*, over-againſt the 22 *Tens*, you muſt ask how many times 4 the *Diviſor* will go in 22; which finding to be 5 times, you muſt ſet down 5 in the *Quotient*, and alſo after the *Diviſor* 4, which makes it 45, the whole *Diviſor* of the 225, that remains for the laſt *Operation*: Then work the *Diviſion* after the uſual Way; ſaying; 5 times 5 is 25: I ſet down 5 under the 5 in 225, and carry the 2 to the 5 times 4, making 22, which ſubtracted from 225, leaves nothing: Thus all is finiſh'd, and the *Square Root* of 625, is 25. In order to *prove* it; Multiply 25 by itſelf, that is to ſay, by 25, and you'll have 625; the *Square* of which is 25, the *Root* or Side.

Second Operation.

	Diviſor.		*Quotient.*
	2)	6.25	25 or
		4	*Roots.*
Diviſor.	45)	225	
		225	

General Directions for finding the Square Root.

THE firſt *Operation* is always wrought like this above, by ſeeking in the Table of *Roots* and *Squares*, the *Root* of the *firſt* Separation on the *Left-hand*; when that is found, you muſt ſet it in the *Quotient*, and alſo in the *Diviſor*; after which you finiſh the *Operation*, by working the *Diviſion* after the *Italian* Method.

THERE muſt be juſt ſo many *Figures* in the *Quotient*, and ſo many *Operations*, as there are *Separations* in the *Sum*. The *third*, the *fourth*, the *fifth*, and *ſixth Operations*, and all that follow, are always perform'd after the ſame Manner as the *ſecond* here above, in taking the *Double* of all the *Quotient* for a *Diviſor* of what remains of the *laſt Operation* that is wrought, and ſo on with the reſt, as we have above ſhewn; obſerving always to put for the *laſt Figure* of the *Diviſor*, *that* which is put in the *Quotient*, at every *Operation*, thereby to finiſh the *Diviſion*, and the *Operation* you are about: This being well underſtood, it will be needleſs to give any Explanation of the following Examples.

Second Example.

A *ſquare* Piece of Land, containing 390625 *Feet*; *How much* is the *Length* and *Breadth*?

Anſ. 625 Foot *long*, and 625 Foot *over*, or *broad*.

Operation.

Operation.

1st Divisor.	6)	39.06.25	*Roots* 625, or *Quotient.*
		36	
2d Divisor.	122)	306	
		244	
3d Divisor.	1245)	6225	
		6225	

IF you multiply the *Quotient* or *Root*, which is 625, by 625, it will produce 390625, which is the *Proof*.

Third Example.

1st Divisor.	2)	5.76.48.06 (2401 *Root*:
		4
2d Divisor.	44)	176
		176
3d Divisor.	480)	48
		00
4th Divisor.	4801)	4806
		4801
		5

OBSERVE, the *laſt Figure* of each *Diviſor* is a *Figure* of the *Quotient*.

IF any Thing remains after you have gone thro' all the *Queſtion*, then the *Number* you took the *Root* of, is not *ſquare:* But if you would find the *Square* of the reſt, you muſt add 2, 4, or 6 *Cyphers*, and continue the *Operations* as above: If you add 2 *Cyphers*, you will have *one Figure* more, which will be the *Uppermoſt* of a *Fraction*, whoſe *Undermoſt* will be 10: If you add 4 *Cyphers*, the two Figures which are in the *Quotient*, will be the *Uppermoſt* of a Fraction, whoſe *Undermoſt* will be 100. Thus you may continue as far as you pleaſe, to bring the Fraction to a greater Nicety.

Otherways. If the Remainder be *leſs* than all the *Quotient*, that will be the *Uppermoſt* of a *Fraction*, whoſe *Undermoſt* will be double all the ſaid *Quotient:* Thus the *Remainder* 5 in the laſt *Example* above, is about $480\frac{5}{2}$: And if the *Remainder* was larger than all the *Quotient*, it would ſtill be the *Uppermoſt* of a *Fraction*, whoſe *Undermoſt* would be twice the whole *Quotient* more 1; and this *Fraction* would expreſs very near the *Root*; but *this* is at beſt but *gueſſing*; the exacteſt Way is annexing *Cyphers* to the *Remainder*, as we ſhewed above.

TO find the *Square Root* of a *Fraction*, as $\frac{4}{18}$; you muſt firſt bring the *Fraction* into its leaſt *Denomination:* Thus $\frac{4}{18}$ may be reduc'd to $\frac{4}{9}$: Afterwards ſay;

The *Square Root* of 4 the *Uppermoſt*, is 2 } wch is $\frac{2}{3}$
—— ——
and the *Square Root* of 9 the *Undermoſt*, is 3 } exactly.

FOR *Proof*, $\frac{2}{3}$ multiplied by $\frac{2}{3}$, produces $\frac{4}{9}$.

BUT if you were to find the *Square Root* of a *Fraction*, whoſe *Uppermoſt* and *Undermoſt* are not ſquare, as $\frac{7}{9}$; you muſt add 2, 4, 6 or 8 *Cyphers* to bring it pretty near, by working after the common Way; or elſe you muſt multiply its *Uppermoſt* 7 by its *Undermoſt* 9, which makes 63; the *Square Root* of which is almoſt 8: So the *Square Root* of $\frac{7}{9}$, is $\frac{8}{9}$ pretty near, tho' not exactly.

TO find the *Square Root* of a *Number* with a *Fraction*; you may bring it all into a *Fraction*, and then work as we juſt now ſaid for $\frac{4}{9}$.

IF you would find the *Square Root* of 20$\frac{1}{4}$, you muſt bring it into $\frac{81}{4}$: Then taking the *Root* of 81, which is 9, and the *Root* of 4, which is 2, you will have $\frac{9}{2}$, or 4$\frac{1}{2}$, the *Square Root* of 20$\frac{1}{4}$.

Otherways. Multiplying 20$\frac{1}{4}$ by 100, produces 2025; the *Square Root* of which is 45, that is to ſay, $\frac{45}{10}$, or 4$\frac{1}{2}$, as before.

MULTIPLYING all the *Quotient* by *itſelf*, and *adding* thereto the *Remainder* of the *Extraction*, if there be any, is a certain *Proof* for every *Extraction* of the *Square Root*.

AS what remains of an *Extraction* is, what ought to be taken from the *ſquar'd Number*, to give the *Root* exactly in whole Numbers; ſo you may eaſily find what ought to be added to make the *Quotient* 1 more; for only add 1 to the ſaid *Quotient*, and *ſquare* it, and from the *Product* ſubtract the Number not *ſquare*, of which you are to find the *Root*; and what remains is to be added to the *Number not ſquare*, to make it exactly *ſquare*, and to make the *Quotient* 1 larger: For *Example*; the *Square Root* of 12 is 3, and there remain 3; I add 1 to the *Quotient* 3, and make it 4, the *Square* of which is 16, from which ſubtracting 12, leaves 4, which muſt be added to 12, to make 16, a Number exactly *ſquare*, inſtead of 12, which is not.

Extraction of the Cube Root.

Example. What is the *Cube Root* of 16777216?
Anſwer. 256.

As there are three Dimenſions to be conſider'd in the *Cube*, which are *Length*, *Breadth*, and *Height*; the *Figures* muſt be ſeparated *three* by *three*; whereby you'll have as many *Figures* in the *Quotient*, in the *Cube Root*, as there are *Separations* in the *Number* to be *extracted*.

Firſt Operation.

16.777.216 } 2 *Quotient of the Roots.*
8 *Cube of the Quot.* }
—
8

The *Cube Root* of 16 is 2, which is ſet in the *Quotient*; and the *Cube* of 2 is 8, which taken from 16, leaves 8 below.

The firſt *Operation* is always perform'd after this Manner, in ſeeking in the *Table* of *Cube Roots*, the *Root* of the *firſt* Separation on the *Left-hand*; and then ſubtracting its *Cube* from the *firſt* Separation, ſetting the *Remainder* below.

Second

Second Operation.

16.777.216 { *Quotient of the Roots,* 25

Diviſor, 8 . . .

1200) 8777 Obſerve the placing of the *two*

7625 *Numbers* 30 & 300, here below.

1152

Root. Prod.

4—300— 5—6000

The *firſt* Figure of the *Quotient,* 2— 30—25—1500

The *Cube* of the *laſt* Figure of the *Quotient,* is 125 125

From the Remainder of the 1ſt *Operation* joined to the next *Separation,* which is 8777, you muſt ſubtract the *Total* of the *three Products,* which is 7625

which leaves 1152, with 216, for the 3d and *laſt Operation.*

An Explanation *of this ſecond* Operation.

THE 2 before the 30 is the firſt Figure of the *Quotient,* and its Square 4, is above it, over-againſt the 300.

FOR a *Diviſor,* you muſt multiply this 4 by the 300, which produces 1200, to be ſet down over-againſt 8777, for the *Diviſor:* Then having inquired *how many* times this 1200 is contained in the Remainder 8777, we ſuppos'd it but 5 times, becauſe of the *Multiplications* which there are to make:

Then you ſet down 5 in the *Quotient*, and alſo at the End of the *little Line*, after the 300 . . Underneath it, and over-againſt the 30, you ſet down its *Square*, and alſo its *Cube* below the *Square*; after that multiply together the *three Numbers* 4—300 and 5; and place their *Product* 6000 at the End of the Line, after the *Root*.

You have alſo multiplied the *three* Numbers below, which are 2—30—25, and ſet down their *Product* 1500, under 6000; and under theſe *two Products* 6000 and 1500, you have advanc'd the *Cube* of the *Root* 5, which is 125, to be added to them; which gives 7625, to be ſubtracted from 8777 that remain, after the firſt *Operation*; which being done, there remain 1152 and 216 for the third and laſt *Operation*.

The whole Operation.
16.777.216
8
Diviſor,
1200) 8777
7625
Diviſor,
187500) 1152216
1152216

Quotient of the Root.
256.

Roots. Prod.
4—300— 5—6000
2— 30—25—1500
Cube 125 here 125
Sum to be ſubt. 7625

Square of the two 1ſt Fig. of the Quot.

Roots, Products.
625—300— 6——1125000
25— 30—36—— 27000
Cube . . . 216 here . . . 216

Sum to be ſubtracted 1152216

Explanation.

Explanation.

YOU ſee the *third Operation* is wrought after the ſame Manner as the *ſecond*, in taking always 300 and 30, and placing them as they are here above, always ſetting the *Quotient* (which was beſore but 25) before the 30; its *Square* 625 before the 300, by which it is multiplied to find the *Diviſor*: Afterwards having found the *Figure* of the *Quotient*, it is ſet down after the 300, and its *Square* underneath it, over-againſt the 30; and its *Cube* below the ſaid *Square*: After that you multiply the *three firſt* Numbers of each of the two Lines, and place their *Products* at the End: Then you add the *Cube* of the *laſt* Figure, or *Root* in the *Quotient*; and *laſtly*, you ſubtract the *Total* of the *three Products*, from what remains of the Extraction, and then the Sum is intirely done.

IF there were 50 *Operations*, they muſt all be done like the *ſecond* and *third*.

IF there be any *Remainder* after the *cubick* Extraction be made, it muſt be taken from the *Number*, to make it a perfect *Cube*; and conſequently, if you would have the *Quotient* 1 larger, to find what is wanting to the Number, you muſt add 1 to the ſaid *Quotient*, and then *cube* it; and the *Difference* between this *Cube*, and the *Number* given to have the *Cube* Root extracted, will be what muſt be added to make it a *Cube*, that will make you the *Quotient* 1 larger.

IF you would find near the Matter, what the *Cube Root* of the *Remainder* of an Extraction is, you muſt add to it 3, 6, 9 or 12 *Cyphers*; and to continue the Extraction by adding 3 *Cyphers*, the *Figure* more which comes in the *Quotient*, will be the *Uppermoſt* of a *Fraction*, whoſe *Undermoſt* will be 10; by adding *ſix Cyphers*, the *two Figures* which come in the *Quotient*, will be the *Uppermoſt* of a Fraction, whoſe *Undermoſt* will be 100, and this Fraction is to be ſet after the *Integers* in the *Quotient* ; &c.

Otherways, the *Remainder* will be the *Uppermoſt* of a Fraction, and what this *Remainder* wants to make 1 more in the *Quotient*, being join'd to the ſaid *Remainder*, will be its *Undermoſt*.

If the *Remainder* were but 1, *three* times the *Square* of all the *Quotient* would be enough for its *Undermoſt*.

To find the *Cube Root* of any Fraction, you muſt firſt bring it to its leaſt *Denomination* ; as if you were to find that of $\frac{54}{128}$, you muſt reduce it to $\frac{27}{64}$: Then taking
the Root of the *Uppermoſt* 27, which is 3 { three
and the Root of the *Undermoſt* 64, which is 4 { *Fourths*.

To find the *Cube Root* of *Integers* and *Fractions*, you muſt reduce the *Integers* into their *Fraction*, and then work as we have juſt now ſhewn in the *Example* of $\frac{27}{64}$.

To find the *Cube Root* of ſuch a Fraction as $\frac{5}{7}$, whoſe *Uppermoſt* and *Undermoſt* are not *Cubes*; you muſt multiply the Square of 7 the *Undermoſt* (which is 49) by 5 the *Uppermoſt*; and then take the *Cube Root* of the Product 245, which is 6 and $\frac{29}{127}$; of which taking the 7*th* Part gives $\frac{721}{889}$, which is the *Cube Root* of $\frac{5}{7}$, or very near it.

To make a Fraction of the *Remainder* of a Cubick Extaction, which is always the *Uppermoſt* ; you muſt ſet down for its *Undermoſt*, the *Difference* between the *Cube* of all the *Quotient*, and the *Cube* of the ſame *Quotient* increaſed by 1 : Thus having taken the *Cube Root* of 245, there remain 29; becauſe the *Cube* of 6 is but 216, and the *Cube* of 7 is 343 : Then the *Difference* between 343 and 216, which is 127, is the *Undermoſt* of the *Remainder* 29, *&c.*

The *Proof* of every *Cubick* Extraction, is in *cubing* all the *Quotient*, and adding to the *Product* the *Remainder* of the Extraction, if there be any.

FINIS.

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OR, THE

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